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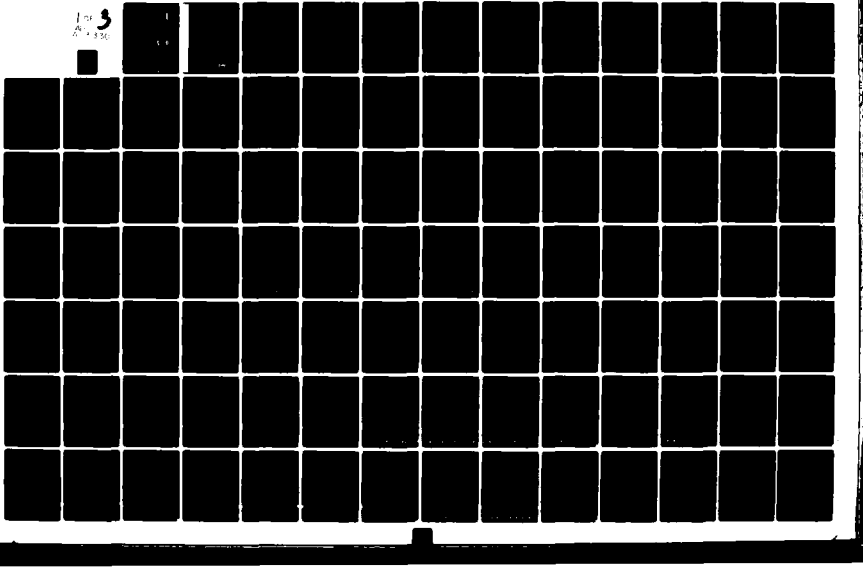

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MX SITING INVESTIGATION
GEOTECHNICAL EVALUATION

VOLUME VIII
NEVADA-UTAH
VERIFICATION STUDIES, FY 79
GEOTECHNICAL DATA,
BIG SMOKY CDP, NEVADA

PREPARED FOR

SPACE AND MISSILE SYSTEMS ORGANIZATION (SAMSO)

NORTON AIR FORCE BASE, CALIFORNIA

FUGRO NATIONAL, INC.
Consulting Engineers and Geologists

FN-TR-27-VIII

MX SITING INVESTIGATION
GEOTECHNICAL EVALUATION
VOLUME VIII, NEVADA-UTAH
VERIFICATION STUDIES, FY 79
GEOTECHNICAL DATA
BIG SMOKY CDP, NEVADA

Prepared for:

U. S. Department of the Air Force
Space and Missile Systems Organization (SAMSO)
Norton Air Force Base, California 92409

Prepared by:

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24 August 1979

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This report evaluates geological, geophysical, + geotechnical data + suitability of portions of Nevada + Utah for siting the MX system. Included are bore data consisting of trench and boring logs, sieve analyses, compression tests, and seismic refraction surveys.

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VOLUME VIII
GEOTECHNICAL DATA, BIG SMOKY CDP

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DRAWINGS IN POCKET

FOREWORD

This report was prepared for the Department of the Air Force, Space and Missile Systems Organization (SAMSO), in compliance with Contract No. F04704-78-C-0027, CDRL Item 005A2. It presents geological, geophysical, and geotechnical data and evaluates the suitability of portions of Nevada and Utah for siting the MX Land Mobile Advanced ICBM System.

This report is the first of several Verification reports which will be prepared. The objectives are to verify sufficient suitable area for deployment of the MX System and to provide preliminary physical and engineering characteristics of the soils. The Verification Studies are the final phase of a site-selection process which was begun in 1977. Previous studies have been termed Screening, Characterization, and Ranking. In preparing this report, it has been assumed that the reader is familiar with these previous studies.

Results of the FY 79 Verification studies are contained in 11 volumes as follows:

Geotechnical Results

Volume 1A - Sections 1.0, 2.0, and 3.0 contain Introduction, Results and Conclusions, and Recommendations for Future Studies. Sections 4.0 through 6.0 contain summary geotechnical data for Whirlwind, Snake East, and Hamlin CDP's.

Volume 1B - Sections 7.0 through 10.0 contain summary geotechnical data for White River North, Garden-Coal, Reveille-Railroad and Big Smoky CDP's.

Geotechnical Data Volumes

Volume II - Whirlwind CDP
Volume III - Snake East CDP
Volume IV - Hamlin CDP
Volume V - White River North CDP
Volume VI - Garden-Coal CDP
Volume VII - Reveille-Railroad CDP
* Volume VIII - Big Smoky CDP
Volume IX - Dry Lake CDP
Volume X - Ralston CDP

* This volume is presented herein.

SECTION 1.0

GEOLOGIC STATION DATA

EXPLANATIONS OF GEOLOGIC STATION DATA

Geologic stations were established at selected locations throughout the CDP at which detailed descriptions of surficial basin-fill deposits or rock were recorded. Locations of all geologic stations are shown in Drawing 1, Activity Location Map. All data taken on surficial basin-fill units at these stations are listed in Table 1-1 and an explanation of the column headings in the table is given below. At stations where rock descriptions were made, only geologic unit designations are listed. A general explanation of all geologic unit symbols used in Verification Studies is included at the end of this section.

Column Heading Table 1-1	Explanation
Station Number	Geologic stations are numbered sequentially. Where more than one geologic field team worked in a CDP, stations made by each team are differentiated with a letter (A, B, or C) following the station number.
Geologic Unit	Generic geologic unit only, i.e. the grain-size designation (f, s, g, c) is omitted from surficial basin-fill units. The letter B in the unit designation indicates a buried deposit not exposed at the surface.
MPS MM	Average maximum particle size in millimeters.
Grain Size (%B, %C, %G, %S, %F)	Estimated particle size distribution using the Unified Soil Classification System. Percentages of boulders (%B) and cobbles (%C) are based on the entire deposit, whereas percentages of gravel (%G), sand (%S) and fines (%F) are taken only on the fraction composed of particles less than 3 inches (76 mm) in diameter.
USCS	Soil class according to the Unified Soil Classification System.

Munsell Color	Soil color based on Munsell Soil Color Chart.
Source Rock Types(s)	Rock types of coarse clasts listed in order of abundance.
* Physical Properties	Data listed in columns 6 through 15 address specific soil properties. These are listed below in parentheses following the column heading number and are also listed at the bottom of Table 1-1. Data are coded with each numerical entry referring to a specific soil condition as listed below.
6 (Grain Shape)	1) Angular, 2) Subangular, 3) Subrounded, 4) Rounded, 5) Well rounded
7 (Moisture Content)	1) Dry, 2) Moist, 3) Wet
8 (Plasticity of Fines)	1) None, 2) Low, 3) Medium, 4) High
9 (Consistency)	Coarse grained: 1) Very Loose, 2) Loose, 3) Medium Dense, 4) Dense, 5) Very Dense, Fine grained: 1)Soft, 2) Firm, 3) Stiff, 4) Hard
10 (Structure)	1) Stratified Tabular, 2) Stratified Other (lensed, cross bedded, discontinuous beds), 3) Nonstratified
11 (Cementation Induration)	1) None, 2) Weak, 3) Moderate, 4) Strong
12 (Depth to Cemented Layers)	Depth to layer (in centimeters) exhibiting cementation induration described in Column 11 (above)
13 (Weathering of clasts)	1) Fresh, 2) Slight, 3) Moderate, 4) Very
14 (Soil Profile Development)	1) None (A-C profile), 2) Poor (incipient B-horizon), 3) Well (prominant B-horizon)
15 (Caliche Development)	1) Stage I, 2) Stage II, 3) Stage III, 4) Stage IV, 5) None

Drainage

DP (M)	Average depth of drainages (in meters)
WD (M)	Average width of drainages (in meters)
Slope (%)	Average slope of ground surface (in percent grade)
Sample	Number of samples taken

GENERALIZED GEOLOGIC UNITS

Explanation

Surficial Basin-fill Units

A1 Younger Fluvial Deposits - Major modern stream channel and flood-plain deposits.

A2 Older Fluvial Deposits - Older incised stream channel and flood-plain deposits in elevated terraces bordering major modern drainages.

A3 Eolian Deposits - Wind-blown deposits of sand occurring as either thin sheets (A3s) or dunes (A3d).

A4 Playa and Lacustrine Deposits - Deposits occurring in modern, active playas (A4) or in either inactive playas or older lake beds and abandoned shorelines associated with extinct lakes (A4o).

A5 Alluvial Fan Deposits - Alluvial deposits consisting of debris flow and water-laid alluvium near mountain fronts, grading into predominantly water-laid alluvium deposited in shifting distributary channels near the basin center. Younger (A5y), intermediate (A5i), and older (A5o) alluvial fans are differentiated by surface soil development, terrain conditions, and present depositional/erosional environment.

Grain sizes of these deposits (except A3 deposits, which are exclusively sandy) are indicated by a single letter (f, s, g, or c) following the geologic unit symbol. These letters indicate the predominant grain size and range of soil types according to the Unified Soil Classification System:

f - fine-grained (ML, CL, MH, CH)

s - sands (SP, SW, SM, SC)

g - gravels (GP, GW, GM, GC)

c - coarse grained with greater than 30 percent boulders and cobbles (generally GP, GW, GM, GC)

ROCK UNITS

I Igneous (undifferentiated). Rocks formed by solidification of a molten or partially molten mass.

- I1 Intrusive - Plutonic rocks formed by solidification of molten material beneath the surface (e.g., granite, granodiorite, diorite, gabbro).
- I2 Extrusive (intermediate and acidic) - Volcanic rocks of intermediate and acidic compositon formed by solidification of molten material at or near the surface, (e.g., rhyolite, latite, dacite, andesite).
- I3 Extrusive (basic) - Volcanic rocks of basic composition, generally formed by solidification of molten materials at or near the surface (e.g., basalt).
- I4 Extrusive (pyroclistic) - Rocks formed by accumulation of volcanic ejecta (e.g., ash, tuff, welded tuff, agglomerate).

S Sedimentary (undifferentiated) - Rocks formed by accumulation of clastic solids, organic solids and/or chemically precipitated minerals.

- S1 Arenaceous and/or Siliceous Rocks - Composed of sand size particles (e.g., sandstone, orthoquartzite) or of cryptocrystalline silica (e.g., opal, chert).
- S2 Carbonate Rocks - Composed predominantly of calcium carbonate detritus or chemical precipitates (e.g., limestone, dolomite, chalk).
- S3 Argillaceous Rocks - Composed of clay and silt-sized particles (e.g., siltstone, shale, claystone).
- S4 Evaporite Rocks - Precipitated from solution as a result of evaporation (e.g., halite, gypsum, anhydrite, sylvite).
- S5 Coarse Clastic Rocks - Composed of gravel sized or larger clasts (e.g., conglomerate, breccia).

M Metamorphic (undifferentiated) - Rocks formed through recrystallization in the solid state of preexisting rocks by heat and pressure (e.g., gneiss, schist, hornfels, metaquartzite).

SOIL DESCRIPTION — TERRAIN

STATION NUMBER	GEOL UNIT	MPS	% BY WT	GRAIN SIZE % GL	% SC	% SS	% SF	USCS	MUNSELL COLOR	CLUNGE AREA	TYPE(S)	PHYSICAL PROPERTIES g	γ	ω	R	LL	PI	12	13	14	15	DRAINAGE DEPTH	DRAINAGE AREA(M)	SLOPE (%)	SAMPLE
N8SG71A	A5Y	035	30	50	02	267	719	SM	10yr5/4	12			1	1	3	2	1			1	1	>6	>60	07	1
N8SG71B	A8Y	072	00	12	03	777	207	SM	10yr6/4	12			2	1	4	3	1	31<	2	1	1	1>0	>04	11	1
N8SG71C	A5I	247	00	70	35	453	112	SM-SCP	10yr5/6	12	14		2	1	3	3	1		2	1	1	4>0	034	4	1
N8SG72A	A1	310	30	50	07	478	225	SM	10yr6/4	12			1	1	3	4	2	1		1	5		302	03	1
N8SG72B	A5I	412	02	07	20	062	620	SM	10yr6/6	12			3	2	1	3	3	21<	2	2	1	2>0	00	34	1
N8SG72C	A5I	160	00	07	15	372	512	SM	10yr5/6	12	17		4	1	1	3	2	22<	2	1	1	1>0	027	14	1
N8SG73A	A5Y	240	00	20	10	045	725	SP-SM	10yr6/4	12	01	13	1	1	1	1	1			1	5	1>0	001	24	1
N8SG73B	A2I	279	00	12	02	273	705	SM	10yr6/6	12	55		1	2	1	3	2	17>	1	1	1	2>0	027	21	1
N8SG73C	A3I	246	00	20	05	245	710	SM-SP	10yr5/6	12			1	2	1	3	1			1	5	1>0	021	24	1
N8SG74A	A5I	279	20	07	25	265	715	SM-SP	10yr5/4	12	51		1	2	1	2	1			1	1	1>0	701	25	1
N8SG74B	A5I	170	00	10	25	350	725	SM	10yr5/6	12	54		2	1	1	3	2	15>	1	1	1	1>0	023	21	1
N8SG74C	A3Y	201	00	30	07	395	205	SP-SM	10yr6/4				1	3	1	3	1			1	1				1
N8SG74D	IJ																								
N8SG75A	A5Y	164	00	10	35	465	420	SM	10yr6/4	12	52		1	2	1	3	2	22<	1	1	1	>0	701	04	1
N8SG75C	A5Y	260	00	10	30	560	400	SM	10yr6/4	12			1	1	1	3	2	25>	1	1	1				1
N8SG76A	A5Y	062	00	07	20	565	410	SM	10yr6/4	12	13		1	1	1	3	2	1		1	1	>1	005	00	1
N8SG76B	A4	060	00	03	10	410	540	ML	10yr3/4				1	2	3	3	1			1	4	>1	003	10	1
N8SG76C	A4	010	00	00	07	360	607	SC	10yr3/4	12			1	2	4	3	1			1	4	>1	170	12	1
N8SG77A	A5Y	240	30	07	20	265	415	SM	10yr6/4	12			1	1	1	3	2	22>	2	1	1	>1	021	07	1
N8SG77B	A5I	226	00	15	35	405	025	SC	10yr6/4	12	52	72	1	1	1	3	2	22>	2	1	1	1>0	020	07	1
N8SG77C	A5Y	130	00	07	12	070	811	SM	10yr5/4	12			1	2	1	3	2	1		1	1	>1	017	1	1
N8SG78A	A5I	160	00	00	30	350	620	SM	10yr5/4	12	17		1	1	1	3	1			1	1	>1	410	07	1
N8SG78B	A5Y	083	30	07	15	463	325	SM	10yr5/4	12			1	2	1	3	3	01>	2	1	1	>1	004	11	1
N8SG78C	A3Y	367	07	25	32	474	102	SP		11	14		1	2	1	3	1			1	5	>1	001	11	1
N8SG79A	A5I	263	00	07	30	055	115	SM	10yr5/4	12			1	1	1	3	2	1		1	1	1>0	036	11	1
N8SG79B	A5I	125	00	07	11	170	707	SM	10yr5/6	12	17		2	1	1	3	2	33>	2	1	1	1>0	076	11	1
N8SG79C	A5I	230	07	15	20	365	715	SM	10yr5/4	11	12		2	2	1	3	1			1	1	1>0	707	14	1
N8SG80A	SJ																								
N8SG81C	A5I	030	07	11	20	072	710	SM-SP		11	11	7	1	2	1	3	1			1	1	>1	04	11	1
N8SG81D	A8Y	190	00	10	07	176	715	SM	10yr5/4	12			1	2	1	3	1			1	1	1>0	021	11	1
N8SG81A	A5Y	100	00	10	10	275	15	SM	10yr5/4	12			1	2	1	4	2	02>	2	2	1	>1	021	11	1
N8SG81L	A5Y	350	07	13	35	045	310	SM-SP		11	12	7	1	2	1	3	2	25>	2	1	1	>1	105	1	1
N8SG81C	A5I	31?	07	7	25	755	47	SC	10yr5/4	12			1	1	2	3	2	12>	2	1	1	1>0	>4	1	1
N8SG82A	A4I	220	07	12	25	045	713	SM-SP	10yr5/4	12			1	1	1	1	2	1	2	1	2	1>0	020	14	1
N8SG82B	SJ																								
N8SG83A	A5I	140	00	17	15	375	510	SM-SP	10yr5/4	11	17		1	2	1	3	2	22>	1	2	1	1>0	11<	1	1
N8SG83B	SJ																								
N8SG84A	I2																								
N8SG84B	I2																								
N8SG85A	A5I	171	30	12	25	375	125	SP-SM	10yr5/4	12	13		1	1	1	2	1	1	2	1	1	5>0	040	11	1
N8SG85B	SJ																								
N8SG86A	I2																								
N8SG86B	I2																								
N8SG87A	A5Y	045	00	3	07	130	127	SP	10yr5/4	12			1	2	1	2	1	2	2	1	1	>0	300	11	1
N8SG87B	I2																								
N8SG88A	A10	021	30	10	02	170	200	SP	10yr5/4	12	5		1	1	1	3	1			1	5	>1	120	07	1
N8SG89A	A6	301	00	02	20	745	225	SM	10yr6/4				3	1	2	3	2	24>		1	2	>0	020		1
N8SG20A	A5I	170	07	10	15	040	775	SP-SM	10yr6/4	13			1	1	1	2	2	16<	2	1	1	>1	002	12	1
N8SG21A	A5Y	055	00	07	25	465	415	SP-SM	10yr5/4	12	17		2	2	1	2	2	1	2	1	5	>1	001	11	1
N8SG22A	A1	035	00	02	07	240	022	SM	17yr5/3	12	12		1	2	1	3	2	24>		1	1	>1	020	11	1
N8SG23A	A1	320	00	10	17	460	024	SM	10yr6/4	12			1	2	1	3	2	25>		1	1	>1	120	11	1
N8SG24A	A5Y	120	00	00	07	095	115	SM	10yr5/3	12			2	1	1	3	2	26>		1	1	>1	203	11	1
N8SG25A	A5Y	125	30	07	20	262	139	SM	10yr6/4	12			1	1	1	4	2	22>		1	1	>1	021	11	1
N8SG26A	A5Y	130	30	11	07	241	172	SM	10yr6/4	12	13		2	2	1	3	2	1		1	5	>1	701	11	1
N8SG27A	I2																								
N8SG28A	A5Y	050	30	02	07	042	120	SM	10yr5/2	12			2	3	1	3	2	1		1	3	>1	006	02	1
N8SG29A	A5I	120	00	12	15	255	130	SC	10yr6/4	12	13		1	2	3	4	3	2	21<	1	2	1>0	104	04	1
N8SG30A	I2																								
N8SG31A	A5Y	60	03	07	10	070	127	SM	10yr6/4	12			2	2	1	3	2	23>	2	2	1	>1	002	2	1
N8SG32A	A5Y	260	30	02	40	240	127	SM-SC	10yr6/3	12			1	1	1	3	1			1	1	>1	004	11	1
N8SG33A	A5I	125	30	01	15	060	225	SM	10yr5/4	12	13		1	1	1	3	1			1	1	>1	004	11	1
N8SG34A	A1	040	00	07	07	220	706	ML	10yr3/4				1	2	1	3	1			1	5	>1	110	11	1
N8SG35A	A5Y	260	07	15	40	740	215	SM-SC	10yr6/4	12	14		1	1	1	2	2			1	1	>1	004	11	1
N8SG36A	A5Y	190	20	10	07	023	727	SM	10yr5/4	12			1	1	1	3	2	1		1	1	>1	002	1	1
N8SG37A	I2																								
N8SG37B	A5Y	025	00	01	15	060	245	SM	10yr3/4	12			1	2	1	4	1			1	1	>1	11<	1	1
N8SG39A	A4	001	10	00	07	205	788	ML	10yr3/3				1	1	1	3	1			1	5	>1	140	11	1
N8SG40A	A5Y	120	30	10	10	165	125	SM-SC	10yr5/4	12			1	1	1	3	2	1		1	1	>1	11<	1	1
N8SG41A	A5Y	245	20	07	25	140	127	SM-SC	10yr6/4	14	16		1	1	1	3	2	22>	1	1	1	>1	004	11	1
N8KG42A	A5Y	165	20	10	05	265	35	SM	10yr5/4	12			1	1	1	3	2	1		1	1	>1	11<	1	1
N8SG43A	A5Y	140	00	10	30	255	15	SM	10yr5/3	12			1	2	1	3	2	24>		1	1	>1	004	11	1
N8SG44A	A5Y	140	00	12	15	270	113	SM	10yr5/4	12			1	2	1	3	1			1	1	>1	004	11	1
N8SG45A																									
N8SG46A	A2I	001	00	00	00	100	207	SP	10yr5/3				4	1	1	1	1	1		1	5				1
N8SG47A	IN																								
N8SG44A	A4	010	00	10	17	130	173	ML	10yr6/4	14			1	1	1	3	1	1		1	4	>1	40	11	1
N8SG48A	A5Y	038	00	00	25	065	110	SM-SP	10yr5/4	12	17		1	1	1	3	1	32>	2	2	1	>1	01		1

*PHYSICAL PROPERTIES :
g = SPECIFIC GRAVITY — γ = CONSISTENCY — 14 = DEPTH TO IMPERMEABLE LAYER(CM) — * = SEE THE DEVELOPMENT
* = MOISTURE CONTENT — 15 = STRUCTURE — 15 = WEATHERING OF CLASTS
R = PLASTICITY INDEX — 11 = DESIGNATION-CONFIGURATION — 14 = SOIL PROFILE DEVELOPMENT

GEOLOGIC STATION DATA
VERIFICATION SITE, BIG SMOKY, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

TABLE 1-1
1 OF 2

FUGRO NATIONAL, INC.

SOIL DESCRIPTION | TERRAIN

STATION NUMBER	GEOL UNIT	MPS	BH	GRAIN SIZE BC	YG	BS	BF	USCS	MUNSELL COLOR	SOURCE ROCK	TYPE(S)	PHYSICAL PROPERTIES 6	7	8	9	10	11	12	13	14	15	DRAINAGE °F(M)	°C(M)	SLOPE (%)	SAMPLE
%4SG[illegible]A	I2																								
%4SG51A	A5Y	029	00	00	10	040	010	SM-SP	10&2Y05/4	I2	I+	2	1	1	2	2	2	020	2	2	1	+0	000	02	1
%4SG52A	A4Y	006	00	00	01	010	005	ML	10& YR6/4	I2		2	1	2	1	2	2	020		1	1	+0	000	01	1
%3SG53A	A5Y	025	00	00	10	360	140	SM	10&2Y05/4	I2		2	1	1	4	1	2	015		2	1	+0	030	07	1
%4SG54A	A5Y	038	00	00	05	095	010	SM-SP	10&2Y04/4	I2	I2	2	1	1	4	2	2	017	2	1	2	+0	010	01	1
%4SG55A	A4Y	005	00	00	01	005	010	SM	10&2Y04/4	I2		2	2	2	2	2	1			2	5	+0	000	00	1
%4SG56A	A5T	060	00	00	15	085	020	SM	07&7YR4/6	I2	I?	2	1	1	2	2	2	05+	2	2	2	+0	00	00	1
%4SG57A	I4																								
%3SG58A	I																								
%4SG59A	A5E	260	01	02	65	020	010	SM-SC		M	I+	I2	I1	2	1	1	1	2	1		2	1	1	+02	000		
%4SG60A	A4Y	007	00	00	03	077	020	SF	10&2YR4/3	M				2	1	1	3	1	2		2	1	5	+0	020		
%4SG61A	A5Y	001	00	00	10	060	020	SM	10&2Y05/4	M		I2		2	1	1	3	2	1		2	1	1	+0	020	00	
%4SG62A	A4I	025	00	00	07	060	040	SC	10&2Y04/4	I2	M			2	2	2	4	2	2	040	4	2	2	00+	040	02	1
%4SG63A	A5I	120	00	01	40	050	010	SP-SM	10&2YR4/4	M		SL		1	1	1	2	2	2	05+	2	1	2	10+	010	00	1
%4SG64A	S1																								
%4SG65A	A5I	240	07	01	30	050	010	SM	10&2YR4/6	I2	I1	M		2	1	1	2	2	2	040	2	1	1				1
%4SG66A	A5I	170	00	00	60	030	005	SP-SC	10&2Y04/3	I2	I4	I1		2	1	1	4	2	3	04+	2	1	1	+00	000		1
%4SG67A	A5Y	130	00	01	20	050	020	SM	10&2Y04/4	I2	M	I2		2	2	2	2	1		1	1	1	1	+0	00+	07	1
%4SG68A	A5Y	10M	00	01	01	060	030	SM	10&2Y04/3	I2				2	2	1	2	1	1	300	2	1	5	+0	020	04	1
%4SG69A	A4Y	200	01	01	20	065	035	SM	10&2Y04/4	I2				2	2	1	2	2	2	04+	2	1	4	+0	040	03	1
%4SG70A	A4I	240	00	00	10	055	030	SM	10&2Y04/4	I2				2	2	1	5	2	2	034	2	1	2	+0	030	02	1
%4SG71A	A5Y	150	00	00	40	065	030	SM	10&2Y04/4	I2				2	1	1	3	2	2	07+	2	2	1	+0	00	00	1
%4SG72A	A1	075	00	00	95	00	005	SP-SM		I2	M	I2	I1	2	1	1	2	1	1		2	1	4	+0	000		
%4SG73A	A1	125	00	00	35	060	005	SM	10&2Y04/3	I2				2	1	1	2	1	1		2	1	4	+0	000	00	
%4SG74A	A5Y	170	00	00	00	060	035	SM	10&2Y04/3	I2	I4			2	2	1	2	1	1		2	1	1	+0	000	00	
%4SG75A	A1	002	00	00	00	090	010	SM	10&2Y05/3					2	2	1	2	1	1		2	1	4				
%4SG76A	A5Y	050	00	00	00	070	030	SM	10&2Y04/4	I2				2	2	1	2	1	1		2	1	4	+0	000	00	1
%4SG77A	A5Y	240	02	00	01	090	010	SM	10&2Y04/4	I2	I2	M		2	1	1	3	2	2	05+	2	1	1	+0	000	00	1
%4SG78A	I3																								
%4SG79A	I2																								
%3SG[illegible]A	A5Y	320	01	01	07	047	006	[illegible]	10&2Y05/3	I2	I1			2	1	1	2	2	1		2	2	1	+00	000	01	1
%4SG[illegible]A	A5Y	020	01	01	10	060	020	SM	10&2Y04/4	I2	I2			2	1	1	2	2	1		2	1	1	+0+	000	07	1
%4SG[illegible]A	A1	010	00	00	00	025	005	SM	[illegible]	I2	M	I?		2	1	1	2	2	1		2	1	1	+0	000	00	1
%4SG[illegible]A	A5I	190	01	01	00	040	010	SM-SC	10&2Y05/3	I2	I1			2	1	1	2	2	2	02+	2	1	2	+0+	010	00	1
%4SG[illegible]A	A5I	040	00	01	01	070	030	SM	10&2Y04/3	I2	M	I4		2	1	1	4	2	2	033	2	1	1	+0+	000	00	1
%4SG[illegible]A	A5I	120	00	01	01	060	010	SM	10&2YR6/4	I2	M	I2		2	1	1	4	1	2	03+	2	1	1	+0+	020	00	1
%4SG[illegible]A	A5Y	265	02	01	27	070	020	SM	10&2Y04/3	M	I?	I2		2	1	1	2	2	1		2	1	5	+0+	000	00	1
%4SG[illegible]A	A5I	250	00	00	40	060	010	SM	10&2Y04/4	I2	M	I2		2	1	1	2	1	1		2	1	4	+0+	000	00	1
%4SG[illegible]A	A4Y	150	02	01	15	050	030	SM	10&2Y04/4	I2	M	I2		2	1	1	2	1	1		2	1	4	+0	010	00	1
%4SG[illegible]A	A5Y	200	00	01	01	080	010	SP-SM	10&2Y04/4	I2				2	1	1	2	1	1		2	1	4	+0	020	00	1
%4SG[illegible]A	A5Y	220	00	01	01	075	020	SM	10&2YR4/4	I2	I?			2	1	1	2	2	2		2	1	5	+0	020	02	1

*PHYSICAL PROPERTIES :
6 - GRAIN SHAPE
7 - MOISTURE CONTENT
8 - PLASTICITY FINES
9 - CONSISTENCY
10 - STRUCTURE
11 - CEMENTATION-INDURATION
12 - DEPTH TO CEMENTED LAYER(CM)
13 - WEATHERING OF CLASTS
14 - SOIL PROFILE DEVELOPMENT
15 - CALICHE DEVELOPMENT

GEOLOGIC STATION DATA
VERIFICATION SITE, BIG SMOKY, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

TABLE 1-1 2 OF 2

FUGRO NATIONAL, INC.

SECTION 2.0

GROUND-WATER DATA

EXPLANATIONS OF GROUND-WATER DATA

Existing ground-water data were collected from all available sources. These data were updated where possible from measurements taken during Fugro field operations, and all data are shown on Table 2-1. Locations of water wells and boreholes in which water-level measurements were available are shown in Drawing 1. Well numbers listed in Column 1 (Table 2-1) refer to well locations in Drawing 1. Actual well numbers giving location according to the Bureau of Land Management Land Survey System are shown in Column 2.

Water levels generally refer to the static ground-water table in the unconfined basin-fill aquifer. Perched conditions or levels in artesian aquifers are noted where known.

WELL NO.	WELL LOCATION NUMBER*	ELEVATION OF GROUND SURFACE-FEET (METERS) ABOVE M.S.L.	DEPTH OF WELL-FEET (METERS)	WATER LEVEL			REFERENCES**/ REMARKS
				DEPTH BELOW GROUND SURFACE-FEET (METERS)	DATE MEASURED	ELEVATION-FEET (METERS) ABOVE M.S.L.	
W1	9N/43E-9ad	5775 (1761)	513 (156)	140 (43)	1962	5635 (1718)	3
W2	9N/43E-9bb	5800 (1768)	513 (156)	140 (43)	1968	5660 (1726)	5
W3	9N/43E-9db	5880 (1793)	601 (183)	215 (66)	1968	5665 (1727)	5
W4	9N/42E-31ad	6100 (1860)	93 (28)	17	1948	6083 (1855)	3,5
W5	8N/39E-13b1	5680 (1732)	42 (13)	25 (8)	1950	5655 (1724)	5
W6	8N/39E-13b2	5680 (1732)	36 (11)	15 (5)	1950	5665 (1727)	5
W7	8N/42E-16	--	100 (30)	38 (12)	1940	--	6
W8	8N/42E-16	--	126 (38)	44 (13)	1940	--	3,6
W9	8N/42E-18	6400 (1951)	55 (17)	35 (11)	1949	6365 (1941)	3,6
W10	8N/43E-15d	6475 (1974)	--	40 (12)	pre 1917	6435 (1962)	3,6
W11	8N/43E-21a	6220 (1896)	90 (27)	85 (26)	1913	6135 (1870)	3
W12	8N/43E-23a	6580 (2006)	--	35 (11)	pre 1917	6545 (1995)	3,6
W13	8N/44E-20c	7110 (2168)	60 (18)	6 (2)	1913	7104 (2166)	7
W14	7N/40E-27cb	5115 (1559)	300 (91)	96 (29)	1964	5030 (1530)	5,7
W15	7N/40E-27dc	5115 (1559)	300 (91)	86 (26)	1968	5029 (1533)	5,7
W16	7N/40E-28ad	5130 (1564)	560 (171)	100 (30)	1964	5030 (1534)	5,7

* Mt. Diablo Baseline and Meridian references:

(1) Fugro field measurements (1979)
(2) Nevada State Engineers Office (1979)
(3) Robinson, Thordarson, and Beetem (1967)
(4) Rush (1968)
(5) Rush and Schroer (1970)
(6) U. S. Geological Survey (1971)
(7) U. S. Geological Survey (1979)

NOTE: All wells tap unconfined alluvial aquifers except where noted. Where published data are lacking or inaccurate, ground surface elevations are taken from topographic maps.

GROUND-WATER DATA
VERIFICATION SITE
BIG SMOKY CDP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

TABLE 2-1 1 OF 8

FUGRO NATIONAL, INC.

WELL NO.	WELL LOCATION NUMBER*	ELEVATION OF GROUND SURFACE-FEET (METERS) ABOVE M.S.L.	DEPTH OF WELL-FEET (METERS)	WATER LEVEL			REFERENCES**/ REMARKS
				DEPTH BELOW GROUND SURFACE-FEET (METERS)	DATE MEASURED	ELEVATION-FEET (METERS) ABOVE M.S.L.	
W17	7N/40E-28cb	5140 (1567)	300 (91)	97 (30)	1964	5043 (1538)	5,7
W18	7N/40E-30a	5140 (1567)	133 (41)	78 (24)	1949	5062 (1543)	5,7
W19	7N/40E-35b	5100 (1555)	420 (128)	90 (27)	1958	5010 (1527)	5,6,7
W20	7N/40E-35ccc	5100 (1555)	1420 (433)	90 (27)	1968	5010 (1527)	5,7
W21	7N/42E-15	--	240 (73)	180 (55)	1949	--	3,6
W22	7N/42E-17c7	5400 (1646)	84 (26)	12 (4)	1949	5388 (1643)	5
W23	7N/42EE-17c11	5430 (1655)	14 (4)	4 (1)	1913	5426 (1654)	3,5
W24	7N/42E-18dc	5380 (1640)	30 (9)	17 (5)	1949	5363 (1635)	5,7
W25	7N/42E-18-8	--	36 (11)	flowing	1949	--	3
W26	7N/42E-18-10	--	100 (30)	flowing	1949	--	3
W27	7N/42E-33aa	5617 (1713)	240 (73)	180 (55)	1949	5437 (1658)	5,7
W28	6N/40E-12ca	5080 (1549)	415 (127)	97 (30)	1962	4983 (1519)	6
W29	6N/40E-12da	5690 (1735)	282 (86)	90 (27)	1961	5600 (1707)	6
W30	6N/40E-13aa1	5080 (1549)	480 (146)	78 (24)	1965	5002 (1525)	5
W31	6N/40E-13aa2	5080 (1549)	387 (118)	80 (24)	1962	5000 (1524)	5,6
W32	6N/40E-13da	5070 (1546)	350 (107)	83 (25)	1979	4987 (1520)	5

* Mt. Diablo Baseline and Meridian references:

(1) Fugro field measurements (1979)
(2) Nevada State engineers Office (1979)
(3) Robinson, Thordarson, and Beetem (1967)
(4) Rush (1968)
(5) Rush and Schroer (1970)
(6) U. S. Geological Survey (1971)
(7) U. S. Geological Survey (1979)

NOTE: All wells tap unconfined alluvial aquifers except where noted. Where published data are lacking or inaccurate, ground surface elevations are taken from topographic maps.

GROUND-WATER DATA
VERIFICATION SITE
BIG SMOKY CDP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

TABLE 2-1 2 OF 8

FUGRO NATIONAL, INC.

WELL NO.	WELL LOCATION NUMBER*	ELEVATION OF GROUND SURFACE-FEET (METERS) ABOVE M.S.L.	DEPTH OF WELL-FEET (METERS)	WATER LEVEL			REFERENCES**/ REMARKS
				DEPTH BELOW GROUND SURFACE-FEET (METERS)	DATE MEASURED	ELEVATION-FEET (METERS) ABOVE M.S.L.	
W33	6N/40E-24aa	5060 (1543)	350 (107)	87 (27)	1963	4973 (1516)	5
W34	6N/40E-34cbb	5000 (1524)	--	178 (54)	1979	4822 (1470)	1
W35	6N/40E-34cbd	--	40 (12)	dry	1979	--	1
W36	6N/40E-34cd	4990 (1521)	--	171 (52)	1979	4819 (1469)	1
W37	6N/40E-34db	4990 (1521)	--	169 (52)	1979	4821 (1470)	1
W38	6N/40E-36c	4999 (1524)	--	96 (29)	1979	4903 (1495)	1
W39	6N/41E-7ba1	5110 (1558)	200 (61)	76 (23)	1963	5034 (1535)	5,6
W40	6N/41E-7ba2	5110 (1558)	350 (107)	92 (28)	1970	5008 (1527)	5,6
W41	6N/41E-7ca	5060 (1543)	244 (74)	87 (27)	1964	4973 (1516)	3,5,6,7
W42	6N/41E-16cc	5098 (1554)	230 (70)	145 (44)	1979	4963 (1513)	5,6
W43	6N/41E-18ca1	5080 (1549)	400 (122)	92 (28)	1963	4988 (1521)	3,5,6
W44	6n/41E-18cb1	5080 (1549)	191 (58)	78 (24)	1962	5002 (1525)	3,5,6
W45	6N/41E-18cb2	5076 (1548)	200 (61)	83 (25)	1968	4993 (1522)	5,7
W46	6N/43E-6cc	6006 (1831)	--	280 (85)	--	5726 (1746)	5
W47	5N/40E-3ba	4980 (1518)	--	172 (52)	1979	4808 (1466)	1
W48	5N/40E-3bc	5003 (1525)	--	186 (57)	1979	4817 (1469)	1

* Mt. Diablo Baseline and Meridian references

(1) Fugro field measurements (1979)
(2) Nevada State Engineers Office (1979)
(3) Robinson, Thordarson, and Beetem (1967)
(4) Rush (1968)
(5) Rush and Schroer (1970)
(6) U. S. Geological Survey (1971)
(7) U. S. Geological Survey (1979)

NOTE: All wells tap unconfined alluvial aquifers except where noted. Where published data are lacking or inaccurate, ground surface elevations are taken from topographic maps.

GROUND-WATER DATA
VERIFICATION SITE
BIG SMOKY COP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

TABLE 2-1
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FUGRO NATIONAL, INC.

WELL NO.	WELL LOCATION NUMBER*	ELEVATION OF GROUND SURFACE-FEET (METERS) ABOVE M.S.L.	DEPTH OF WELL-FEET (METERS)	WATER LEVEL			REFERENCES**/ REMARKS
				DEPTH BELOW GROUND SURFACE-FEET (METERS)	DATE MEASURED	ELEVATION-FEET (METERS) ABOVE M.S.L.	
W49	5N/40E-3ca1	4975 (1517)	--	153 (47)	1979	4822 (1470)	1
W50	5N/40E-3ca2	--	155 (47)	dry	1979	--	1
W51	5N/40E-3cb	4979 (1518)	--	170 (52)	1979	4809 (1466)	1
W52	5N/40E-3cc	4972 (1516)	--	156 (48)	1979	4816 (1468)	1
W53	5N/40E-4d	5000 (1524)	--	204 (62)	1979	4796 (1462)	1
W54	5N/40E-10b	--	52 (16)	dry	1979	--	1
W55	5N/40E-33d	4882 (1488)	700 (213)	90 (27)	1913	4792 (1461)	5
W56	5N/41E-5bd1	5002 (1525)	135 (41)	130 (40)	1979	4872 (1485)	5
W57	5N/41E-5bd2	5002 (1525)	180 (55)	125 (38)	1965	4877 (1487)	5,6
W58	5N/41E-6a	5020 (1530)	135 (41)	124 (38)	1913	4896 (1493)	3,6
W59	4N/41E-16db	4858 (1481)	98 (30)	55 (17)	1968	4803 (1464)	5,7
W60	4N/41E-30db	4830 (1473)	47 (14)	43 (13)	1913	4787 (1459)	5,7
W61	3N/40E-2c1	4815 (1468)	61 (19)	40 (12)	--	4775 (1456)	6
W62	3N/40E-2cd	4817 (1469)	280 (85)	50 (15)	1968	4767 (1453)	5,7
W63	3N/40E-11bb	4815 (1468)	61 (19)	39 (12)	1959	4776 (1456)	5,7
W64	3N/41E-10cb	5000 (1524)	210 (64)	202 (62)	1913	4798 (1463)	3,5,7

* Mt. Diablo Baseline and Meridian references:

(1) Fugro field measurements (1979)
(2) Nevada State Engineers Office (1979)
(3) Robinson, Thordarson, and Beetem (1967)
(4) Rush (1968)
(5) Rush and Schroer (1970)
(6) U. S. Geological Survey (1971)
(7) U. S. Geological Survey (1979)

NOTE: All wells tap unconfined alluvial aquifers except where noted. Where published data are lacking or inaccurate, ground surface elevations are taken from topographic maps.

GROUND-WATER DATA
VERIFICATION SITE
BIG SMOKY CDP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

TABLE 2-1
4 OF 8

FUGRO NATIONAL, INC.

WELL NO.	WELL LOCATION NUMBER*	ELEVATION OF GROUND SURFACE - FEET (METERS) ABOVE M.S.L.	DEPTH OF WELL - FEET (METERS)	WATER LEVEL			REFERENCES**/ REMARKS
				DEPTH BELOW GROUND SURFACE - FEET (METERS)	DATE MEASURED	ELEVATION - FEET (METERS) ABOVE M.S.L.	
W65	3N/41E-19ab	4773 (1455)	--	8 (2)	1969	4765 (1453)	7
W66	3N/41E-2acd	5070 (1546)	310 (95)	240 (73)	1949	4830 (1473)	5,7
W67	3N/41E-26-1	--	179 (55)	42 (13)	1964	--	2
W68	3N/41E-26-2	5233 (1595)	312 (95)	42 (13)	1964	5191 (1583)	2
W69	3N/41E-28	--	310 (95)	240 (73)	1950	--	1,6
W70	3N/42E-4-1	--	330 (101)	310 (95)	1950	--	2
W71	3N/42E-4-2	--	30 (9)	20 (6)	1950	--	2,6
W72	3N/42E-9	--	179 (55)	42 (13)	1963	--	2
W73	3N/42E-11	6130 (1869)	330 (101)	132 (40)	1949	5998 (1829)	3,6
W74	3N/42E-11	--	35 (11)	20 (6)	1949	--	2
W75	3N/42E-21	5639 (1719)	312 (95)	9 (3)	1963	5630 (1716)	2,6
W76	3N/42E-32	5550 (1692)	179 (55)	20 (6)	1963	5530 (1686)	6
W77	1N/41E-26a	4875 (1486)	--	61 (19)	1913	4814 (1468)	4
W78	1N/41E-26d	4901 (1494)	>400 (>122)	61 61	--	4840 (1476)	6
W79	1N/42E-33d	4958 (1512)	160 (49)	148 (45)	--	4810 (1466)	6
W80	1N/42E-34c	4940 (1506)	160 (49)	148 (45)	--	4792? (1461)	4

* Mt. Diablo Baseline and Meridian references

(1) Fugro field measurements (1979)
(2) Nevada State Engineers Office (1979)
(3) Robinson, Thordarson, and Beetem (1967)
(4) Rush (1968)
(5) Rush and Schroer (1970)
(6) U. S. Geological Survey (1971)
(7) U. S. Geological Survey (1979)

NOTE: All wells tap unconfined alluvial aquifers except where noted. Where published data are lacking or inaccurate, ground surface elevations are taken from topographic maps.

GROUND-WATER DATA
VERIFICATION SITE
BIG SMOKY CDP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

TABLE 2-1
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FUGRO NATIONAL, INC.

WELL NO.	WELL LOCATION NUMBER*	ELEVATION OF GROUND SURFACE-FEET (METERS) ABOVE M.S.L.	DEPTH OF WELL-FEET (METERS)	WATER LEVEL			REFERENCES**/ REMARKS
				DEPTH BELOW GROUND SURFACE-FEET (METERS)	DATE MEASURED	ELEVATION-FEET (METERS) ABOVE M.S.L.	
W81	1S/41E-4c	4825 (1471)	72 (22)	46 (14)	1965	4779 (1457)	4
W82	1S/41E-18a	4825 (1471)	72 (22)	48 (15)	1965	4777? (1456)	4
W83	1S/42E-3	4930 (1503)	--	197 (60)	--	4733 (1443)	6
W84	1S/42E-10aa	4990 (1521)	310 (95)	210 (64)	1950	4780? (1457)	4,6

* Mt. Diablo Baseline and Meridian references:

(1) Fugro field measurements (1979)
(2) Nevada State Engineers Office (1979)
(3) Robinson, Thordarson, and Beetem (1967)
(4) Bush (1968)
(5) Rush and Schroer (1970)
(6) U. S. Geological Survey (1971)
(7) U. S. Geological Survey (1979)

NOTE: All wells tap unconfined alluvial aquifers except where noted. Where published data are lacking or inaccurate, ground surface elevations are taken from topographic maps.

GROUND-WATER DATA
VERIFICATION SITE.
BIG SMOKY CDP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

TABLE 2-1 6 OF 6

FUGRO NATIONAL, INC.

SECTION 3.0

SEISMIC REFRACTION DATA

EXPLANATIONS OF SEISMIC REFRACTION DATA

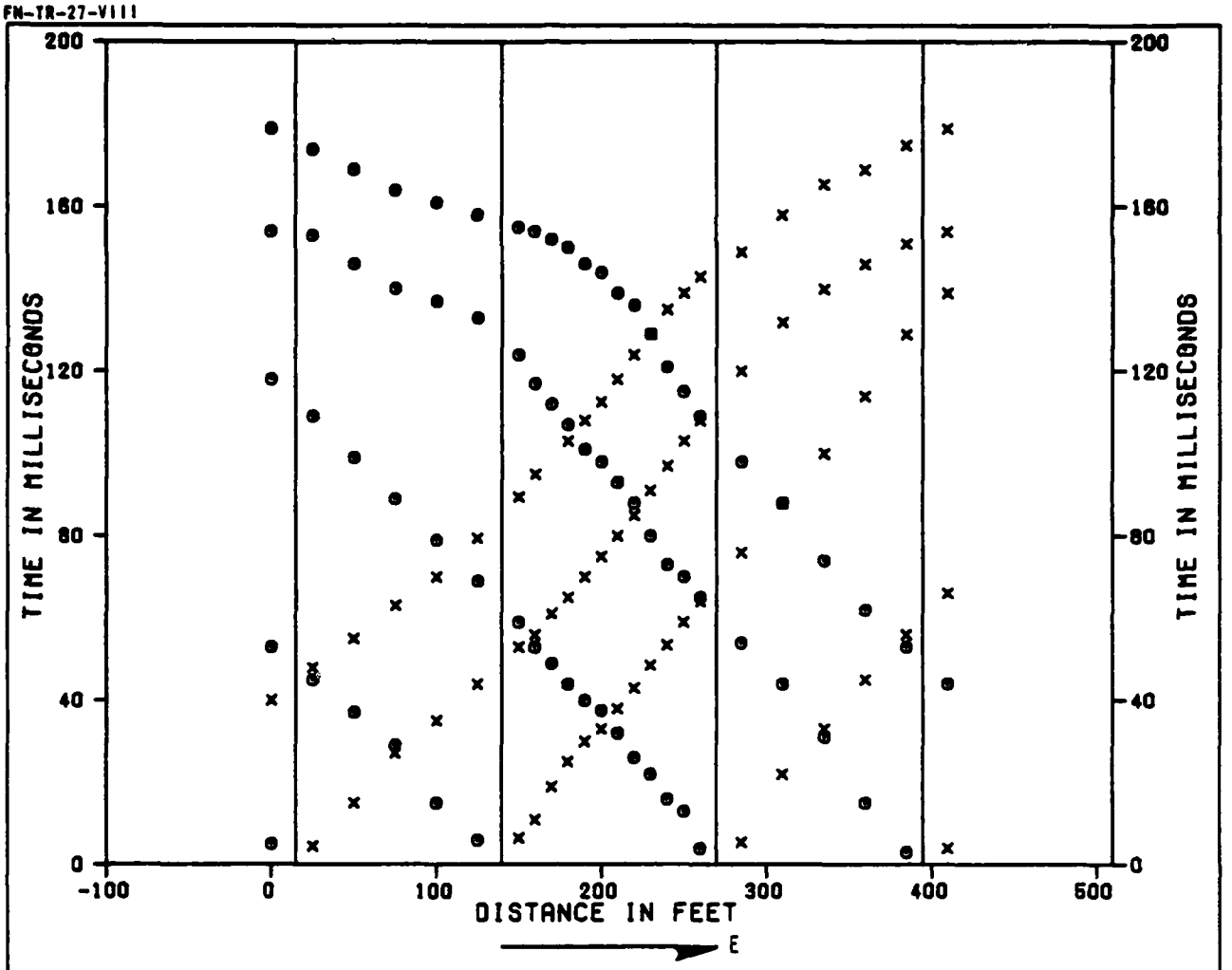
Each figure shows seismic wave travel times plotted versus surface distance between the energy source (shot) and the detector (geophone) for a single seismic line. Distances are measured along the line from geophone number 1 which is designated as zero distance. Distances to the right (on the paper) of geophone 1 are positive. The direction arrow gives the approximate direction of the geophone array from geophone 1 to geophone 24.

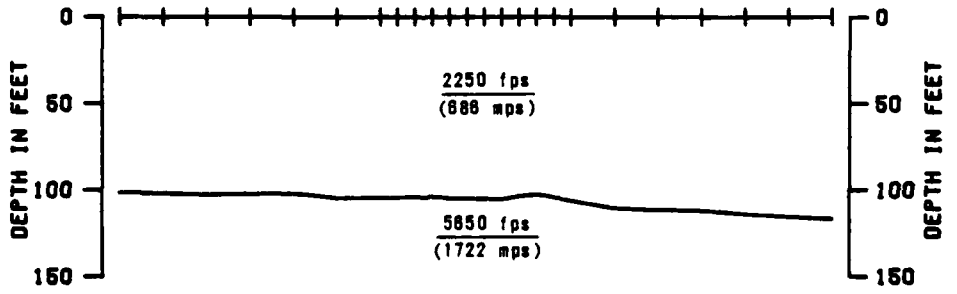
Travel Time Versus Distance Graph (Upper Half of Figure)

This is a travel time versus distance graph. The abscissa represents distance; the ordinate, time. The six vertical lines represent the locations of shots (designated as F, G, H, I, J, and K). The symbol, X, denotes travel times at geophones that were located to the right of a shot. The symbol, ⊙, denotes travel times that were located to the left of shots.

Velocity Cross Section (Lower Half of Figure)

This is an interpreted velocity cross section beneath the seismic line. The top line represents the ground-surface profile. The short vertical lines crossing the top line mark the geophone positions. The depth scale is plotted relative to a point on the line which was arbitrarily chosen as "zero elevation" at the time the line was surveyed. The additional lines across the cross section represent the interpreted boundaries between layers of material with different compressional wave velocities. These boundaries are commonly called "refractors". The velocity interpreted to be representative of each layer is shown.





0 METERS 50

DISTANCE AND DEPTH

× TIMES TO RIGHT OF SHOTS

⊙ TIMES TO LEFT OF SHOTS

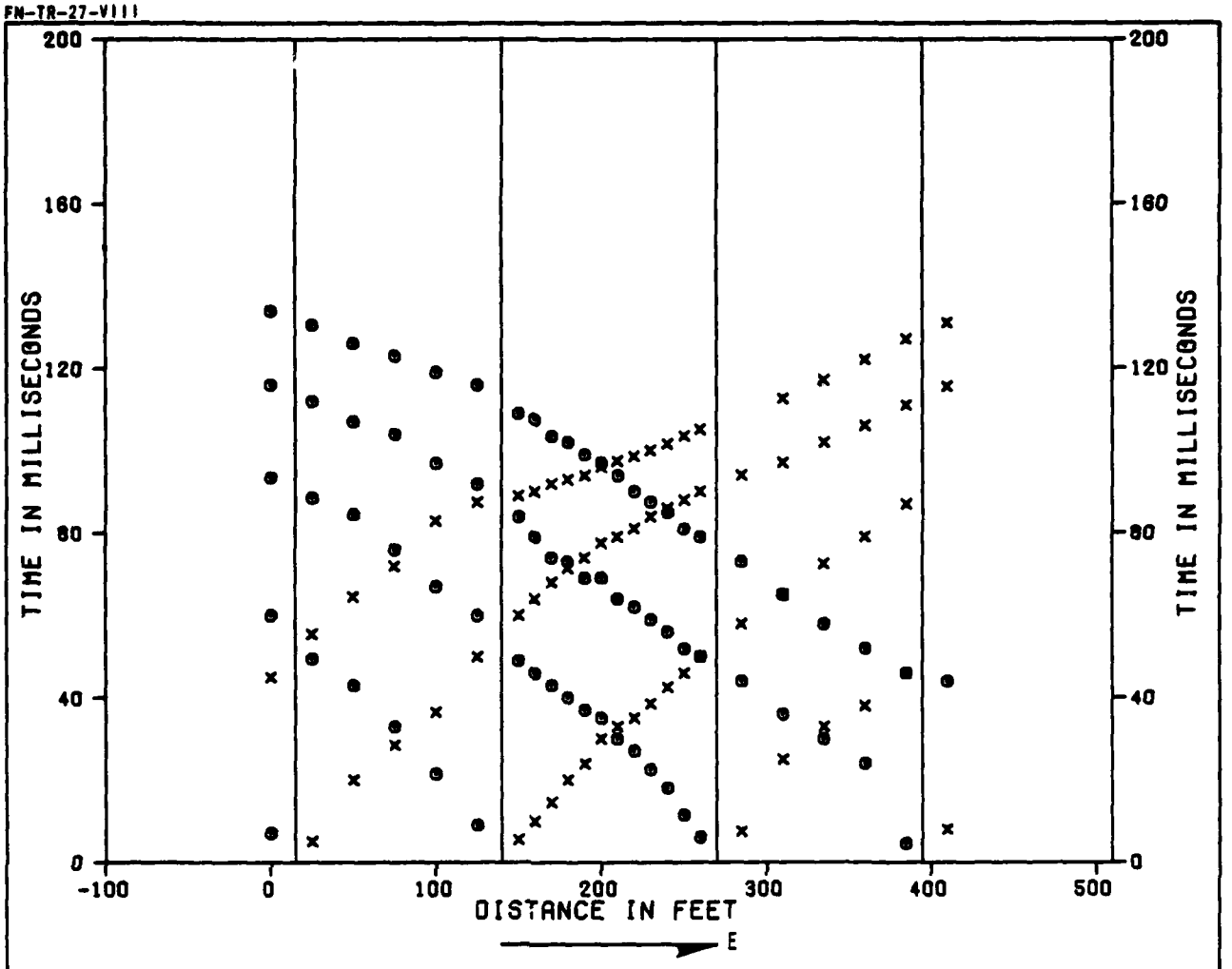
SEISMIC REFRACTION LINE BS-S-1
TIME DISTANCE DATA AND VELOCITY PROFILE
VERIFICATION SITE, BIG SMOKY COP, NEVADA

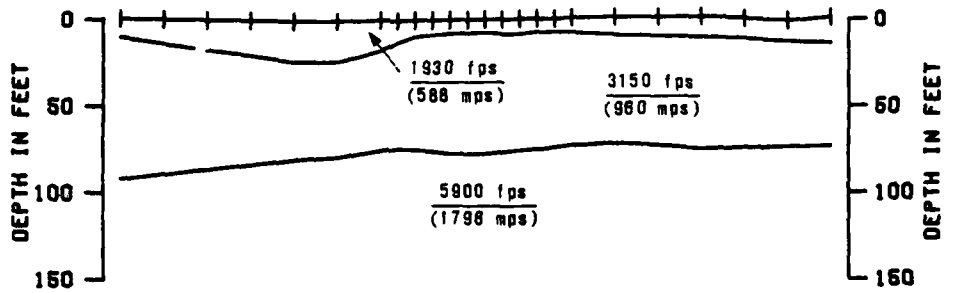
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

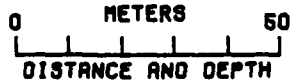
FIGURE 3-1

FUGRO NATIONAL, INC.

2 JUL 79







× TIMES TO RIGHT OF SHOTS
⊙ TIMES TO LEFT OF SHOTS

SEISMIC REFRACTION LINE BS-S-2
TIME DISTANCE DATA AND VELOCITY PROFILE
VERIFICATION SITE, BIG SMOKY CDP, NEVADA

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DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 3-2

FUGRO NATIONAL, INC.

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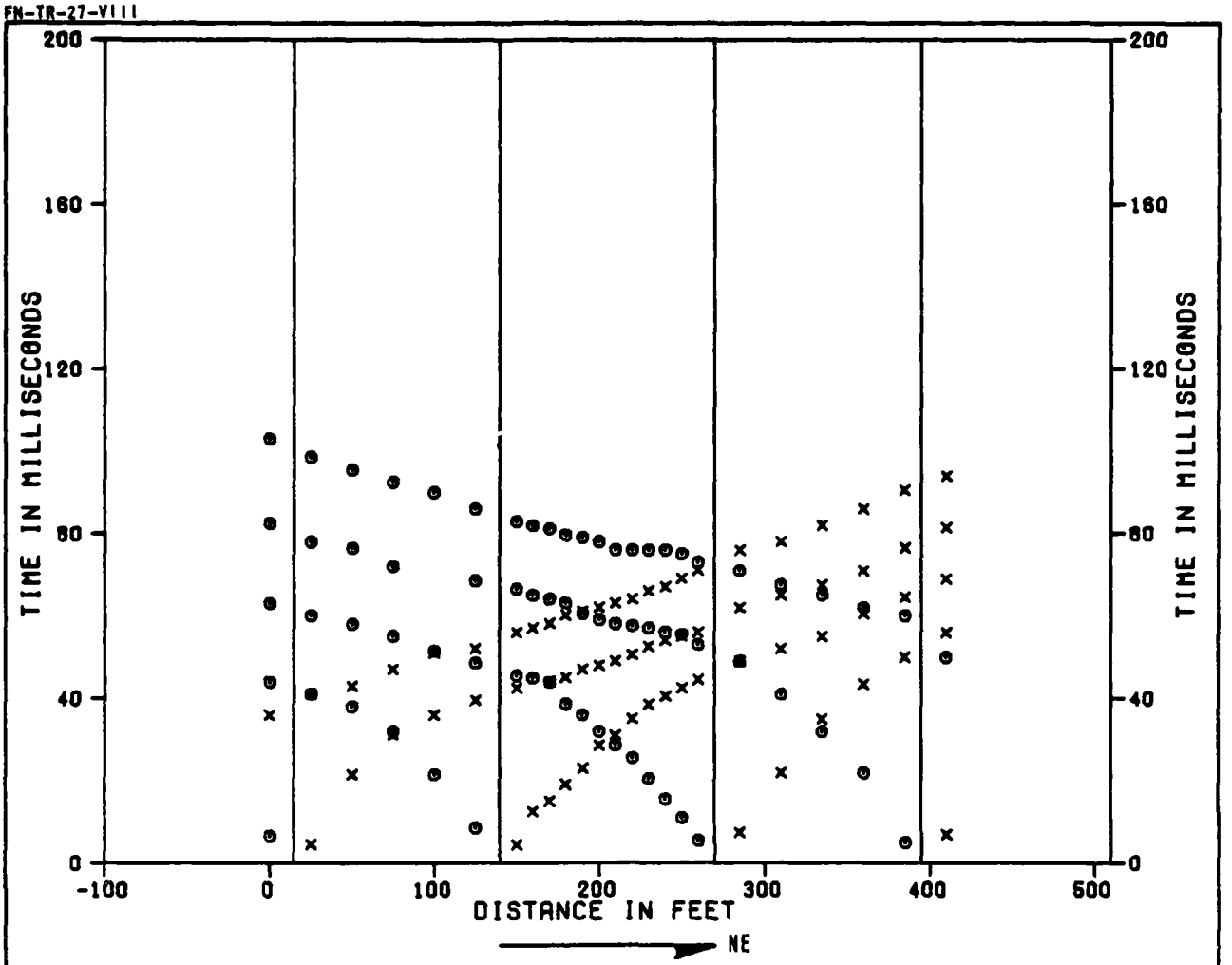

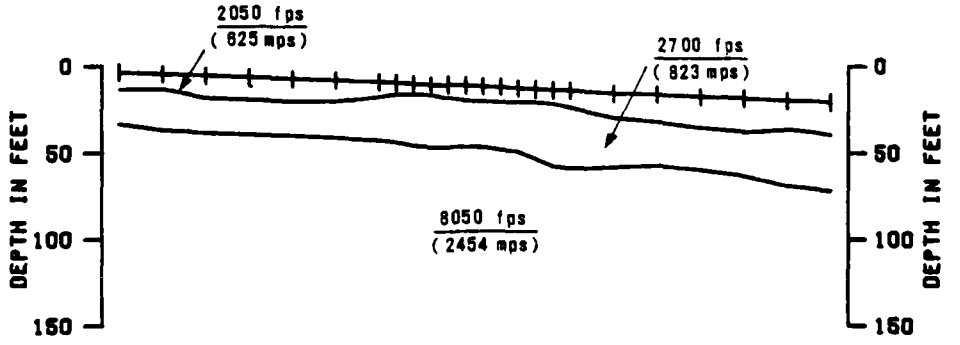

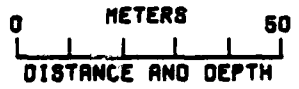

× TIMES TO RIGHT OF SHOTS
⊙ TIMES TO LEFT OF SHOTS

SEISMIC REFRACTION LINE BS-S-3
TIME DISTANCE DATA AND VELOCITY PROFILE
VERIFICATION SITE, BIG SMOKY CDP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 3-3

FUGRO NATIONAL, INC.

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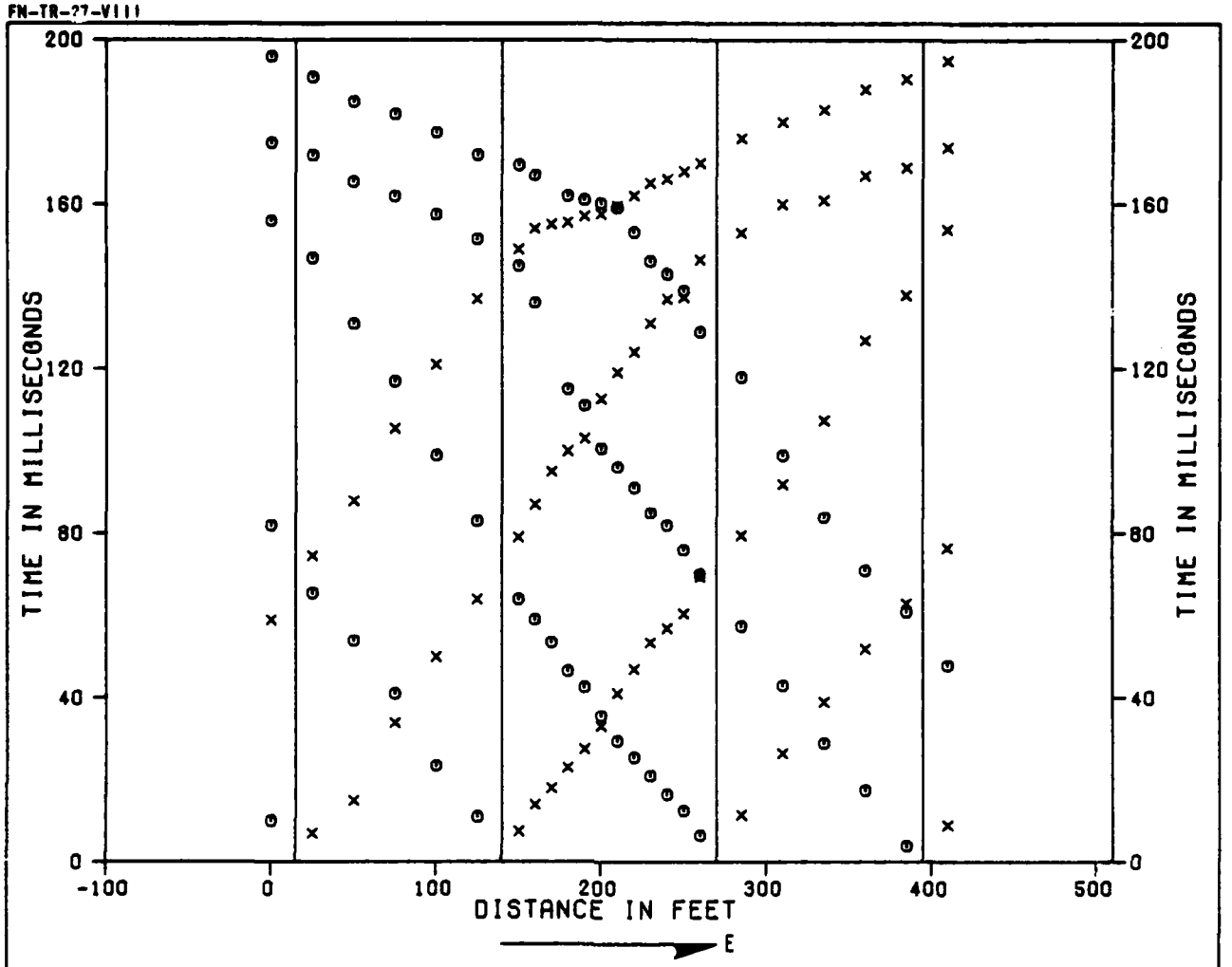
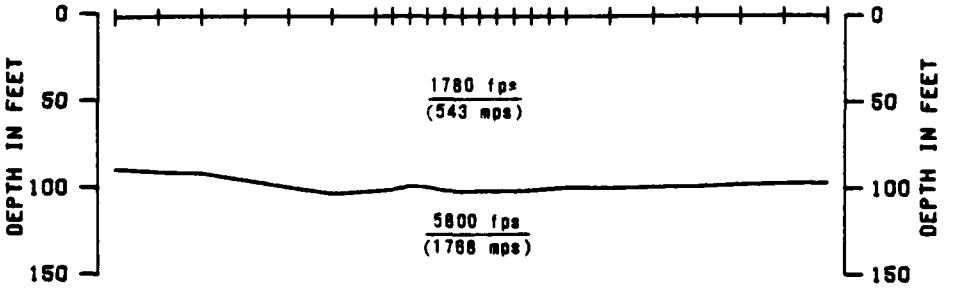
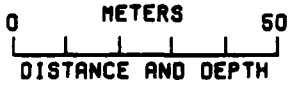
FN-TR-??-VIII







× TIMES TO RIGHT OF SHOTS
⊙ TIMES TO LEFT OF SHOTS

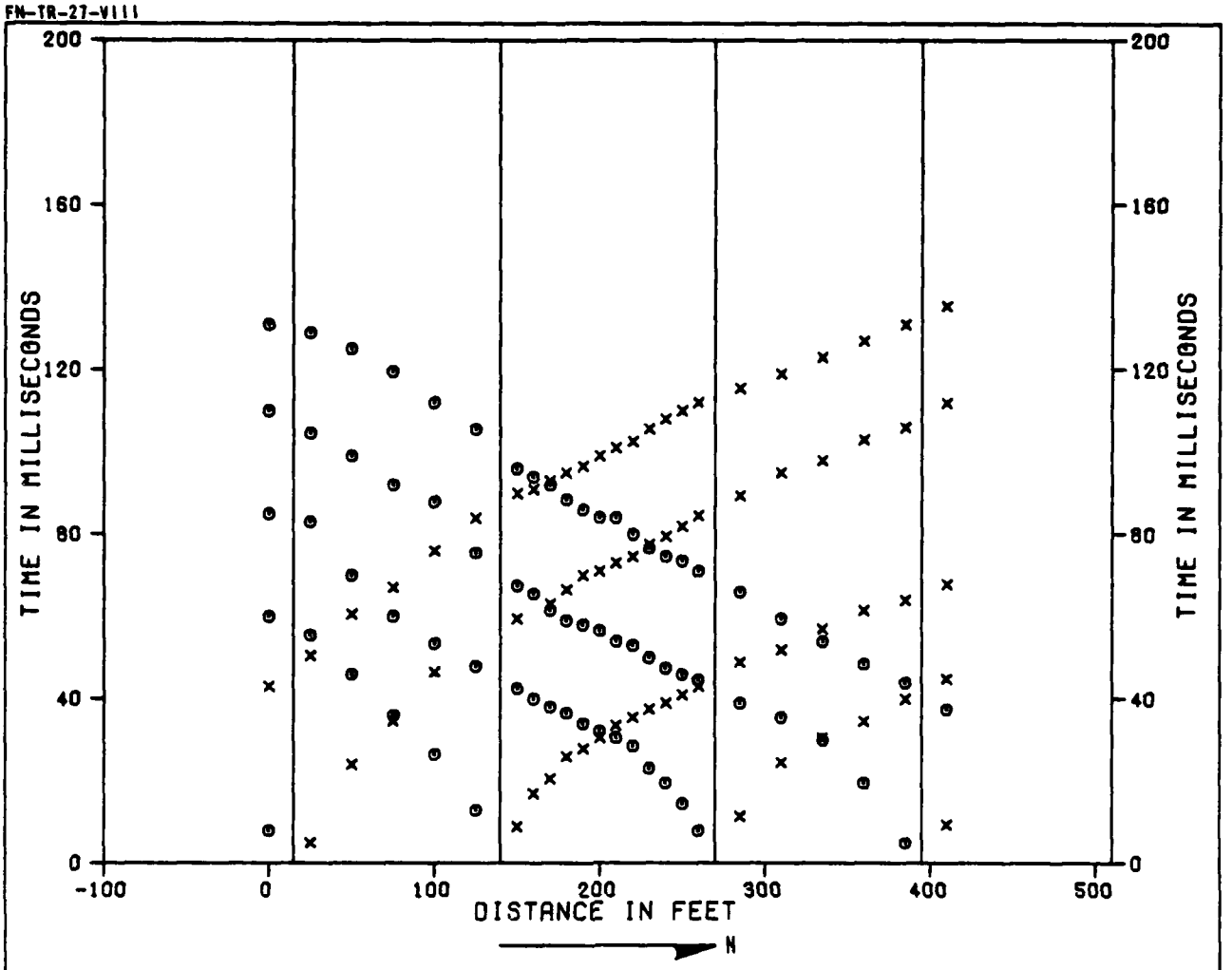
SEISMIC REFRACTION LINE BS-S-4
TIME DISTANCE DATA AND VELOCITY PROFILE
VERIFICATION SITE, BIG SMOKY CDP, NEVADA

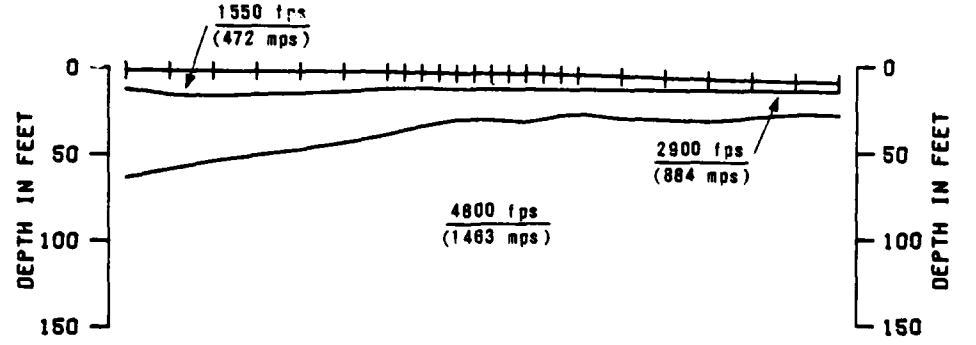
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

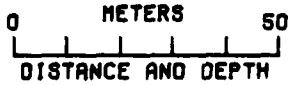
FIGURE 3-4

FUGRO NATIONAL, INC.

2 JUL 79







× TIMES TO RIGHT OF SHOTS
⊙ TIMES TO LEFT OF SHOTS

SEISMIC REFRACTION LINE BS-S-5
TIME DISTANCE DATA AND VELOCITY PROFILE
VERIFICATION SITE, BIG SMOKY COP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 3-5

FUGRO NATIONAL, INC.

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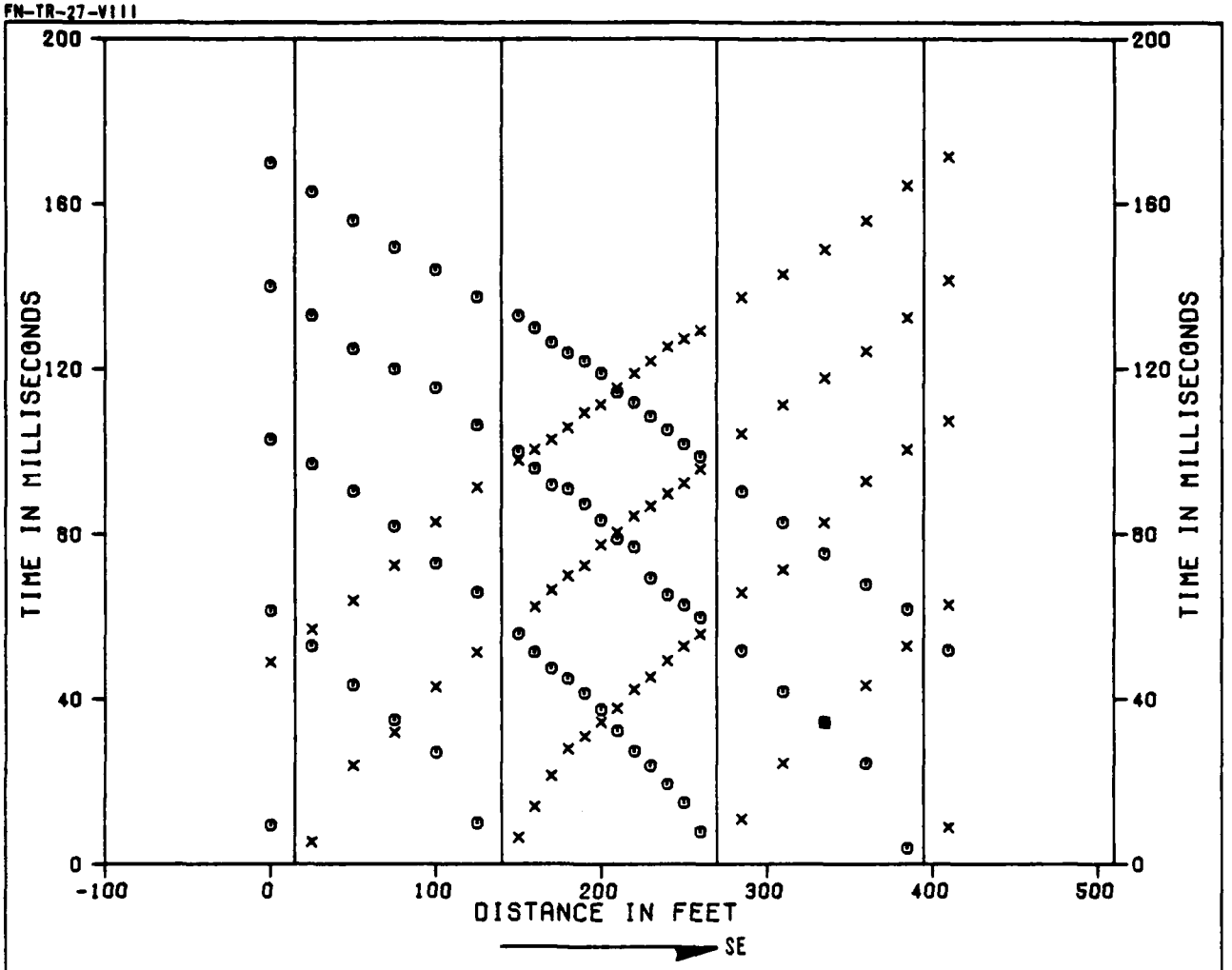
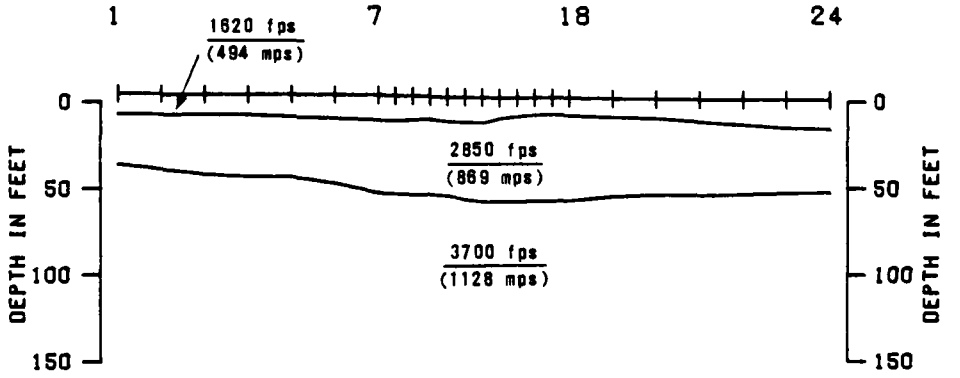
FN-TR-27-VIII





0 METERS 50

DISTANCE AND DEPTH

× TIMES TO RIGHT OF SHOTS

⊙ TIMES TO LEFT OF SHOTS

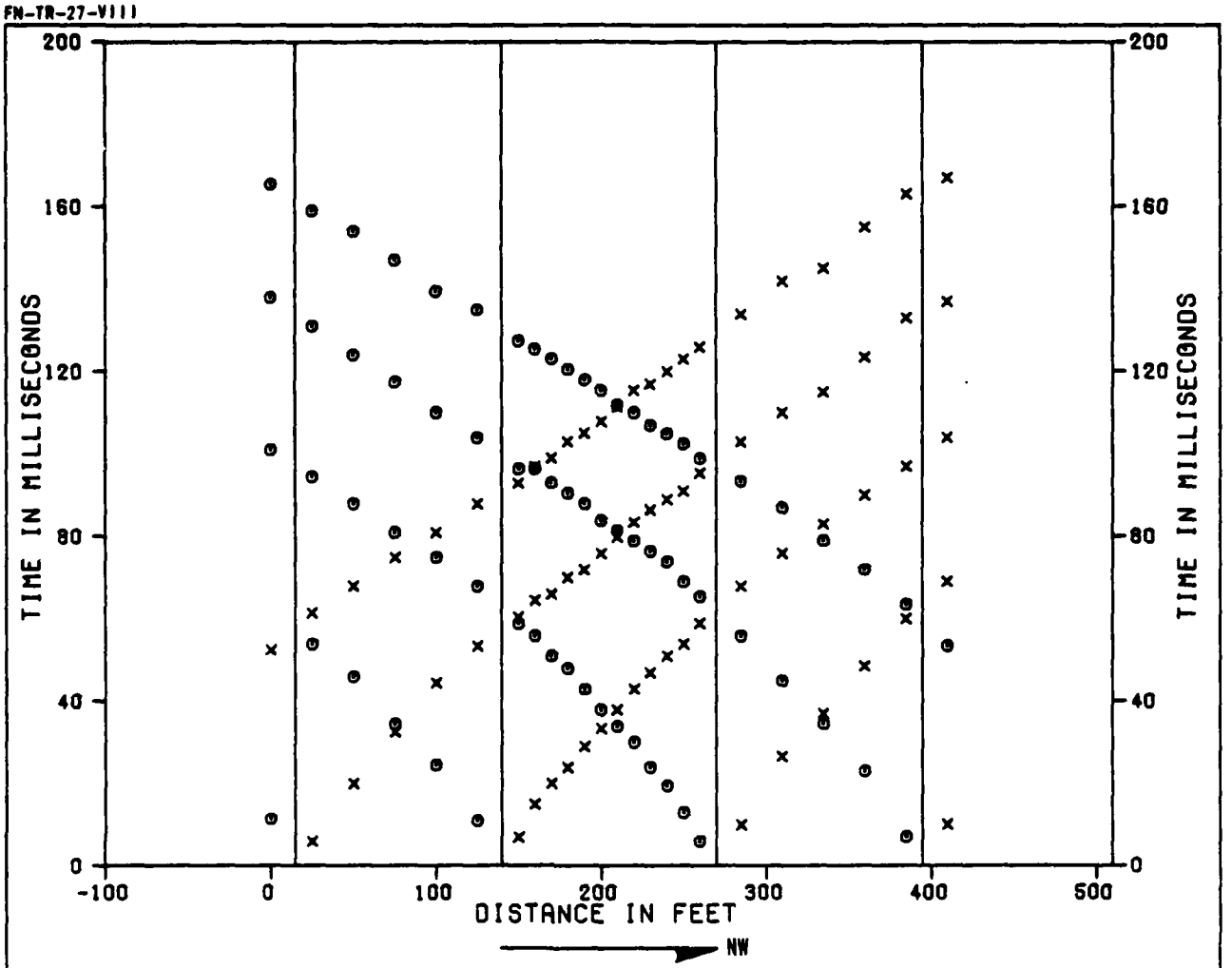
SEISMIC REFRACTION LINE BS-S-6
TIME DISTANCE DATA AND VELOCITY PROFILE
VERIFICATION SITE, BIG SMOKY CDP, NEVADA

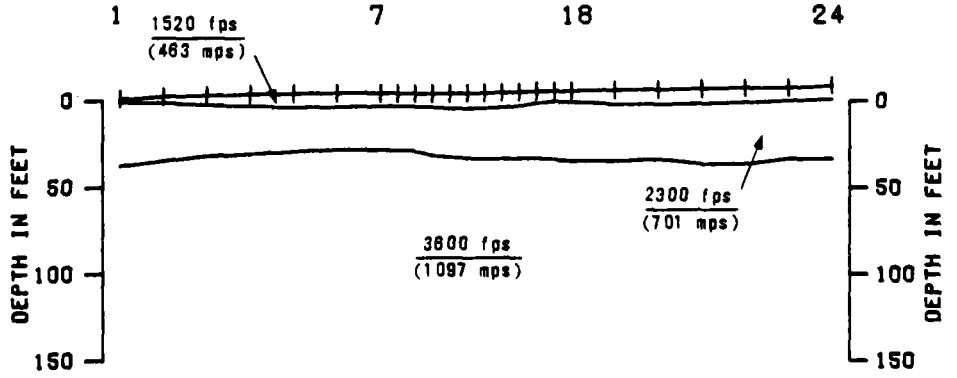
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 3-6

FUGRO NATIONAL, INC.

2 JUL 79





0 METERS 50

DISTANCE AND DEPTH

× TIMES TO RIGHT OF SHOTS

⊙ TIMES TO LEFT OF SHOTS

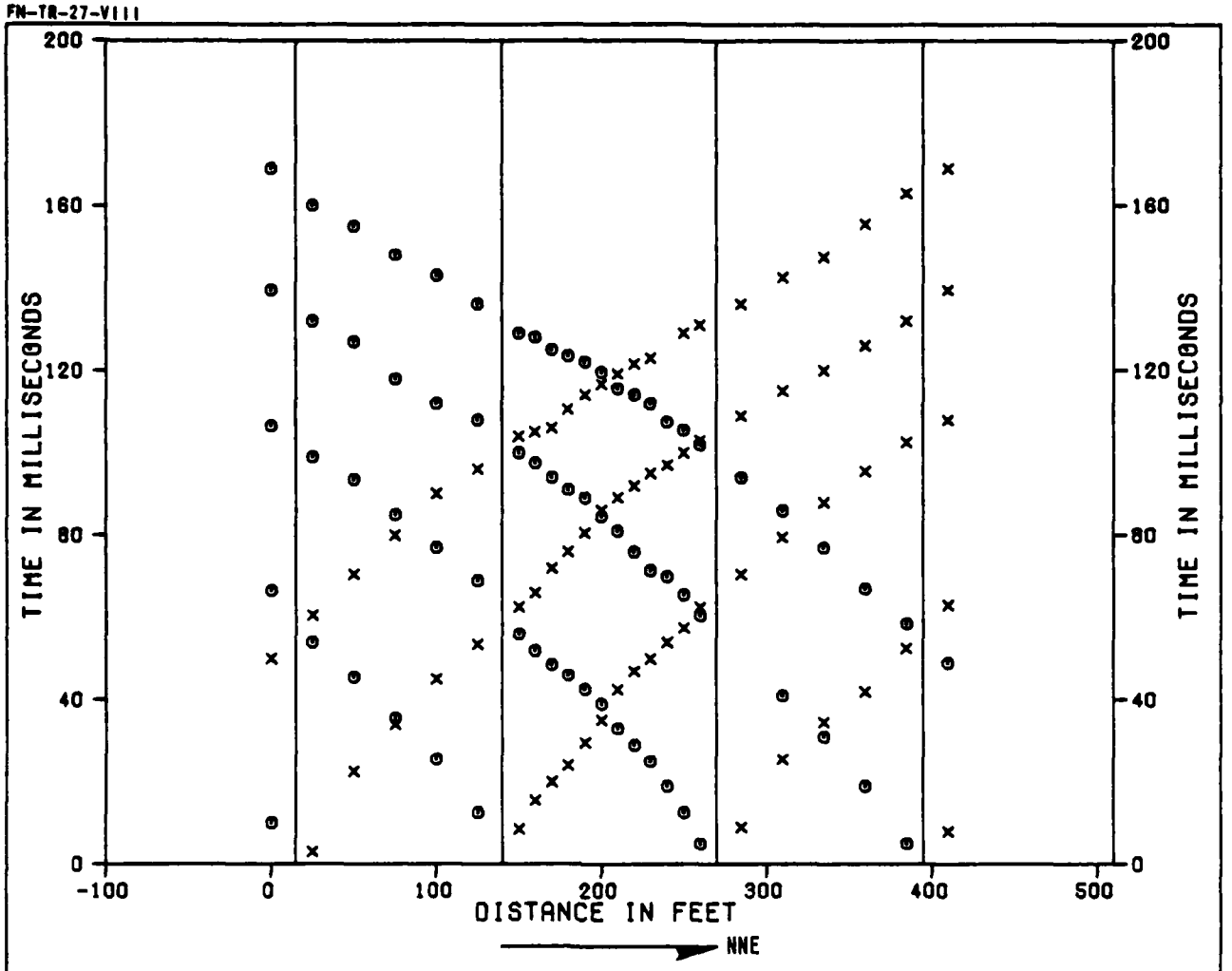
SEISMIC REFRACTION LINE BS-S-7
TIME DISTANCE DATA AND VELOCITY PROFILE
VERIFICATION SITE, BIG SMOKY COP, NEVADA

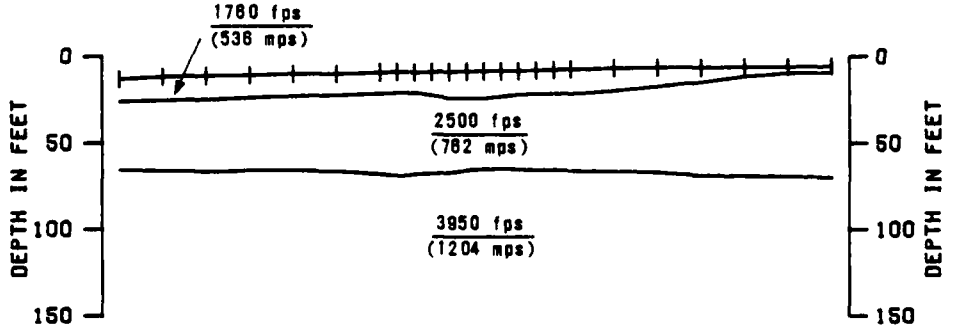
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 3-7

FUGRO NATIONAL, INC.

2 JUL 79





0 METERS 50

DISTANCE AND DEPTH

× TIMES TO RIGHT OF SHOTS

⊙ TIMES TO LEFT OF SHOTS

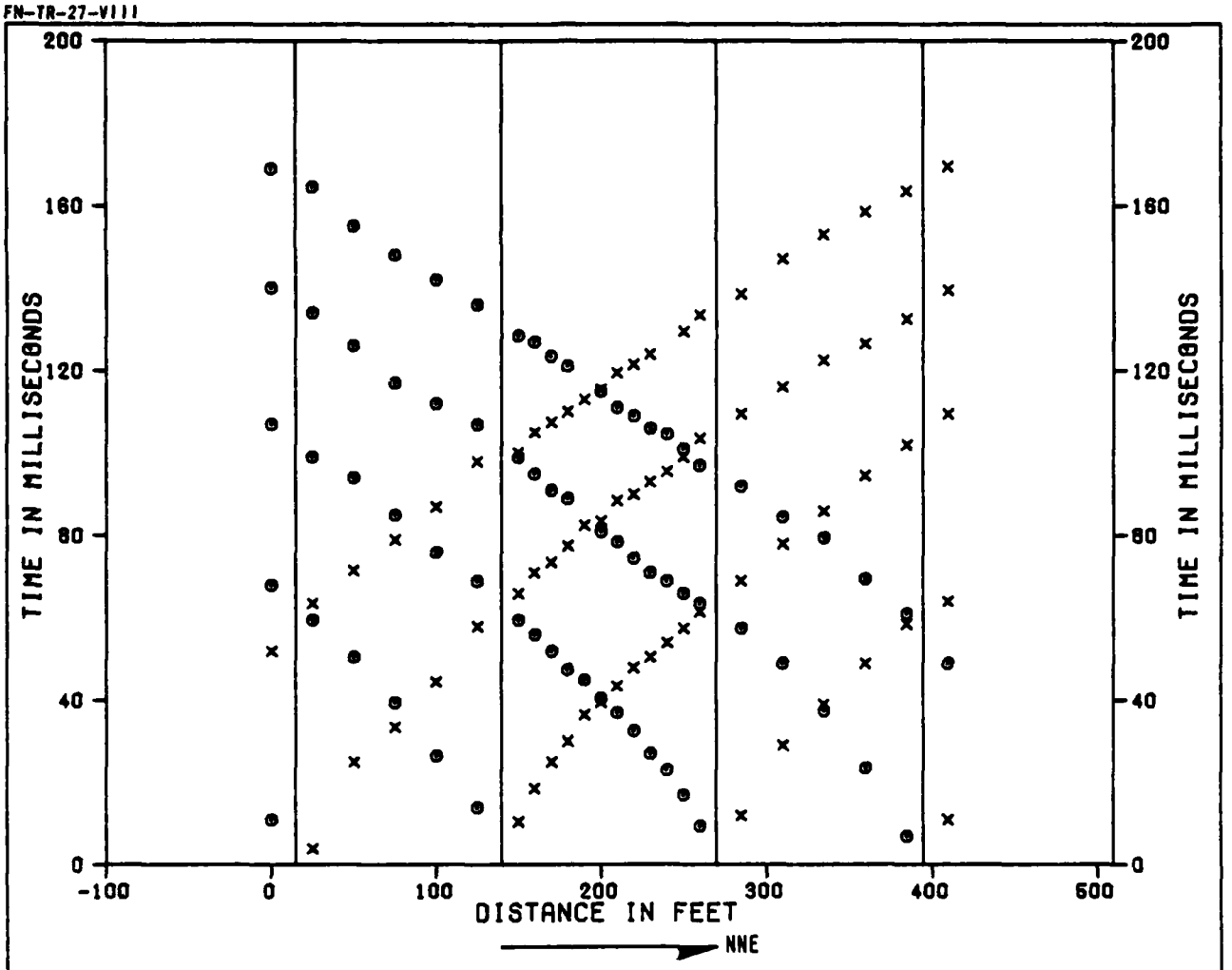
SEISMIC REFRACTION LINE BS-S-8
TIME DISTANCE DATA AND VELOCITY PROFILE
VERIFICATION SITE, BIG SMOKY CDP, NEVADA

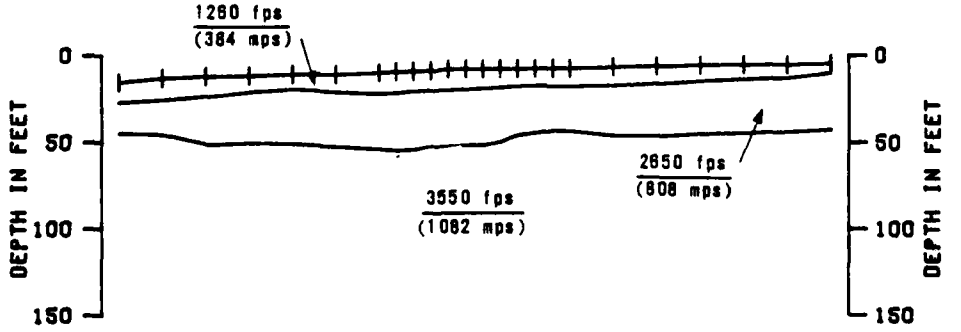
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

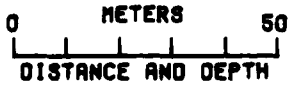
FIGURE 3-8

FUGRO NATIONAL, INC.

2 JUL 79







× TIMES TO RIGHT OF SHOTS
⊙ TIMES TO LEFT OF SHOTS

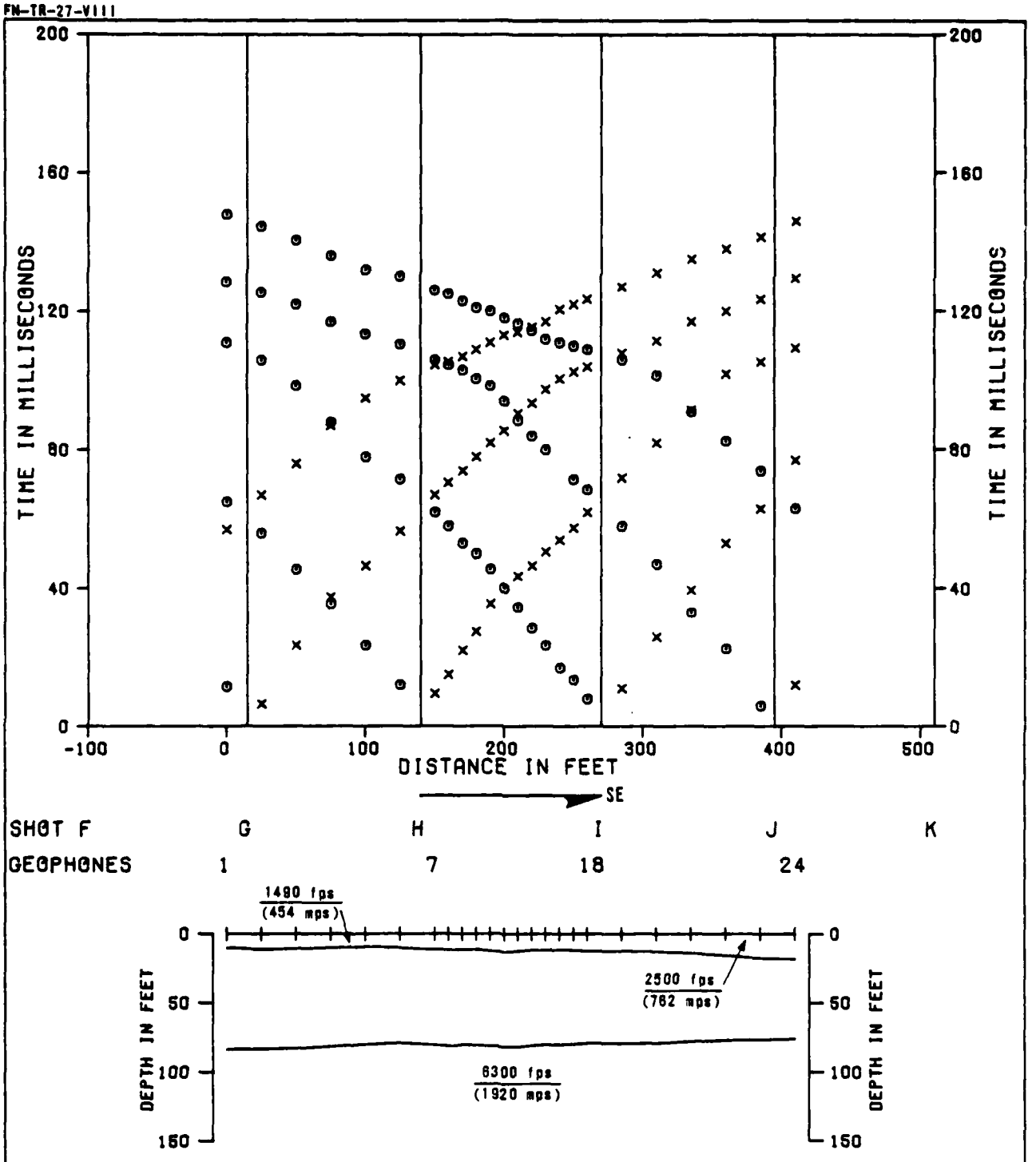
SEISMIC REFRACTION LINE BS-S-9
TIME DISTANCE DATA AND VELOCITY PROFILE
VERIFICATION SITE, BIG SMOKY COP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 3-9

FUGRO NATIONAL, INC.

2 JUL 28



SEISMIC REFRACTION LINE BS-S-10
TIME DISTANCE DATA AND VELOCITY PROFILE
VERIFICATION SITE, BIG SMOKY CDP, NEVADA

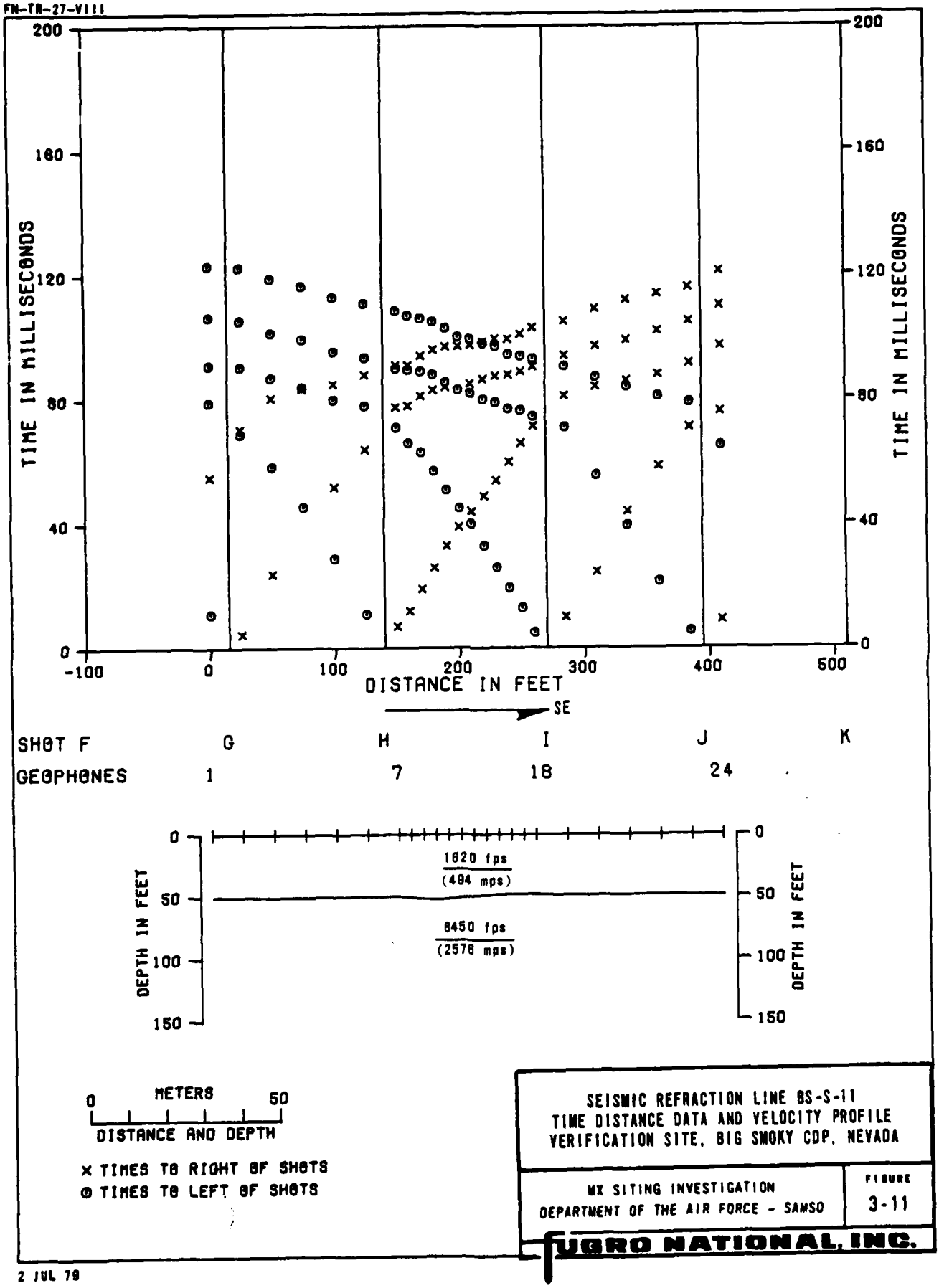
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 3-10

FUGRO NATIONAL, INC.

2 JUL 79

FN-TR-27-VIII



SEISMIC REFRACTION LINE BS-S-11
TIME DISTANCE DATA AND VELOCITY PROFILE
VERIFICATION SITE, BIG SMOKY COP, NEVADA

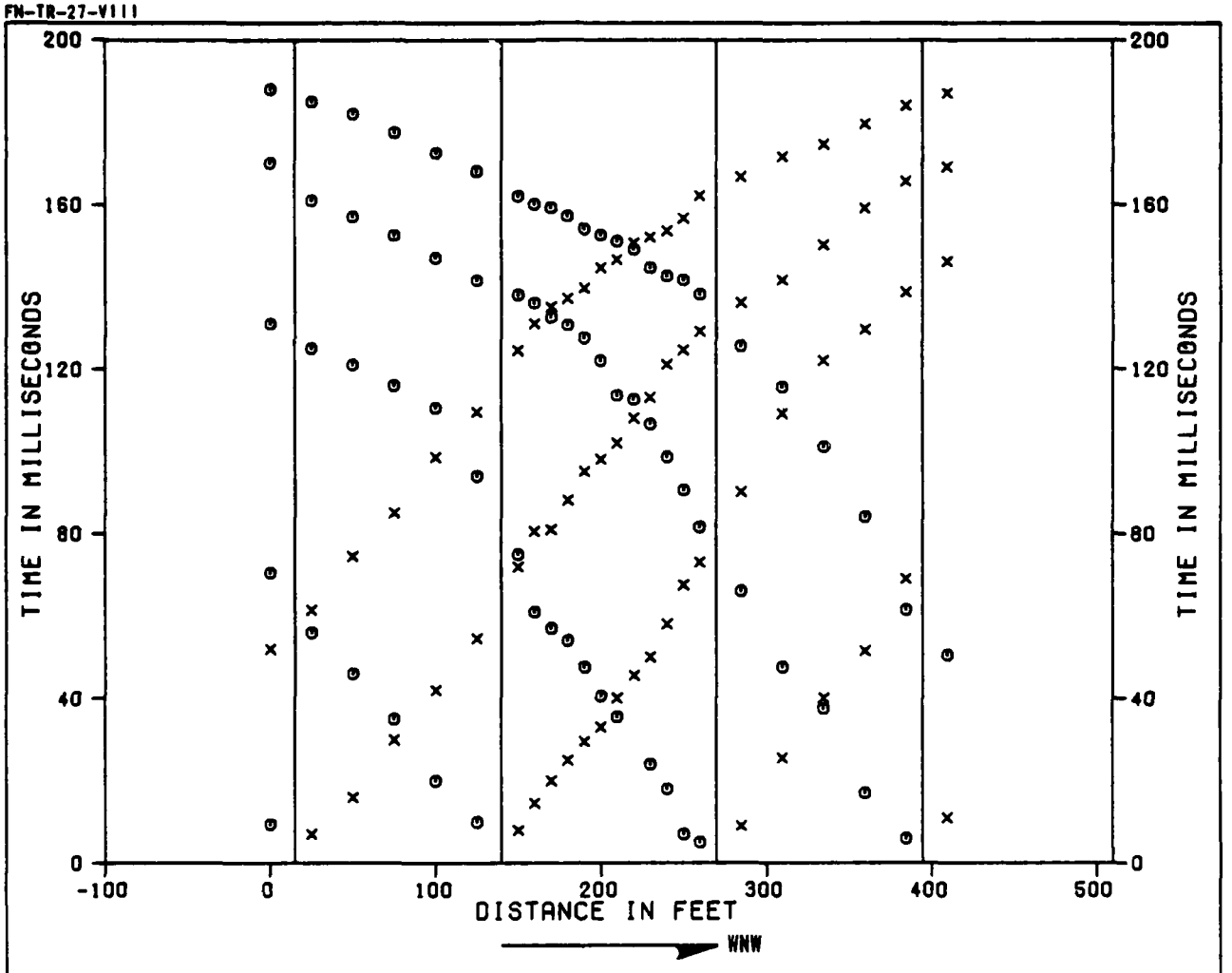
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

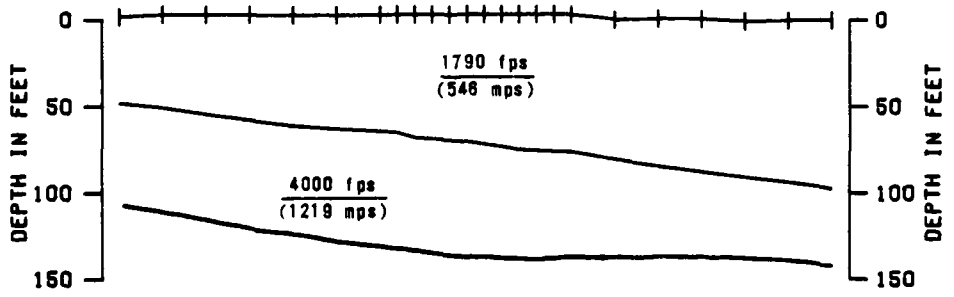
FIGURE
3-11

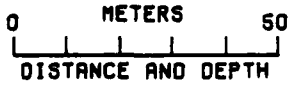
FUGRO NATIONAL, INC.

2 JUL 79

FN-TR-27-VIII







× TIMES TO RIGHT OF SHOTS
⊙ TIMES TO LEFT OF SHOTS

SEISMIC REFRACTION LINE BS-S-12
TIME DISTANCE DATA AND VELOCITY PROFILE
VERIFICATION SITE, BIG SMOKY COP, NEVADA

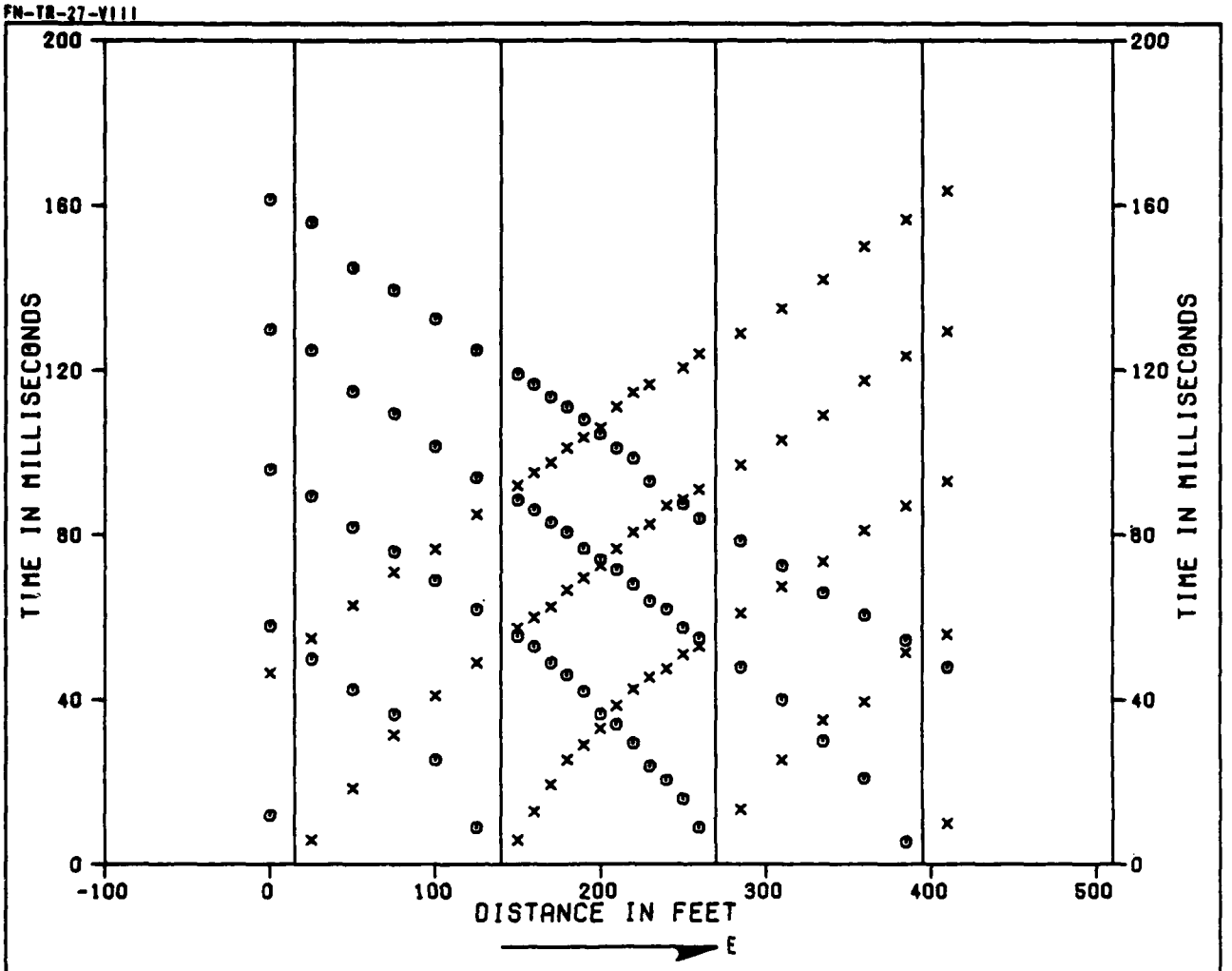
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

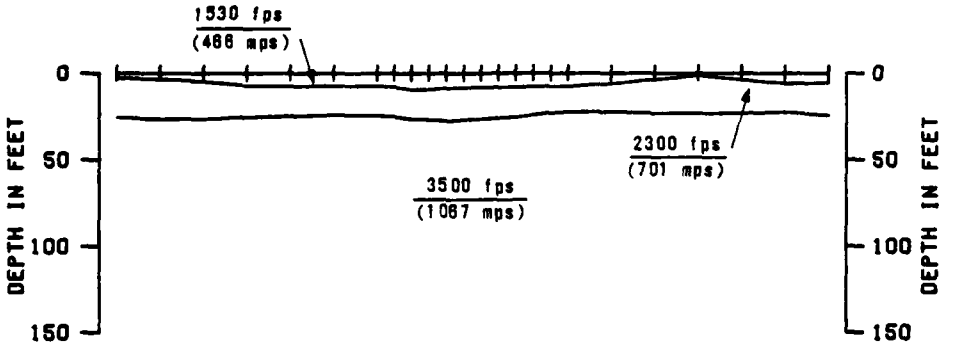
FIGURE 3-12

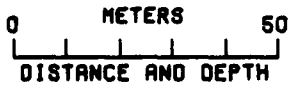
FUGRO NATIONAL, INC.

2 JUL 79

FN-TR-27-VIII







× TIMES TO RIGHT OF SHOTS

⊙ TIMES TO LEFT OF SHOTS

SEISMIC REFRACTION LINE BS-S-13
TIME DISTANCE DATA AND VELOCITY PROFILE
VERIFICATION SITE, BIG SMOKY CDP, NEVADA

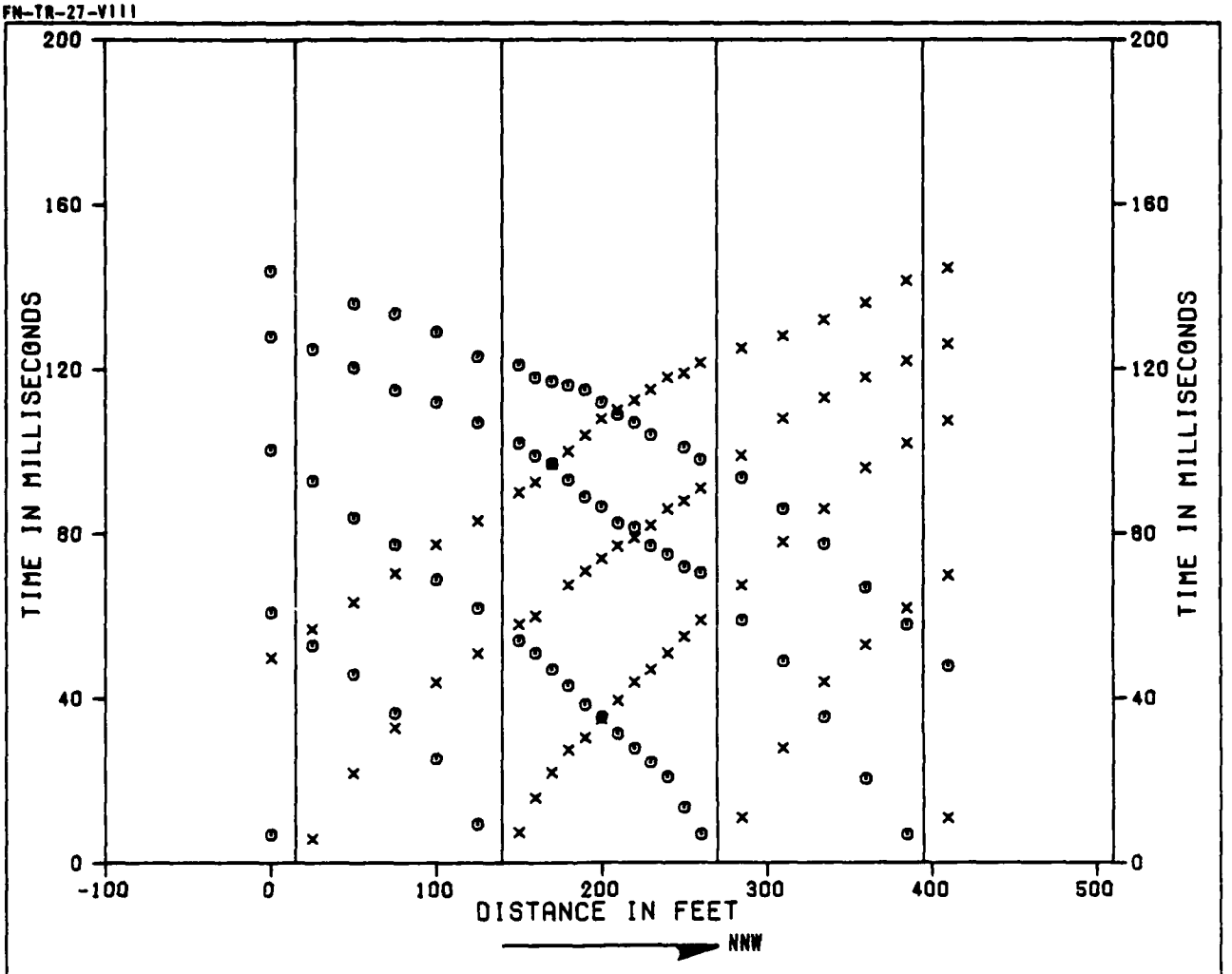
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

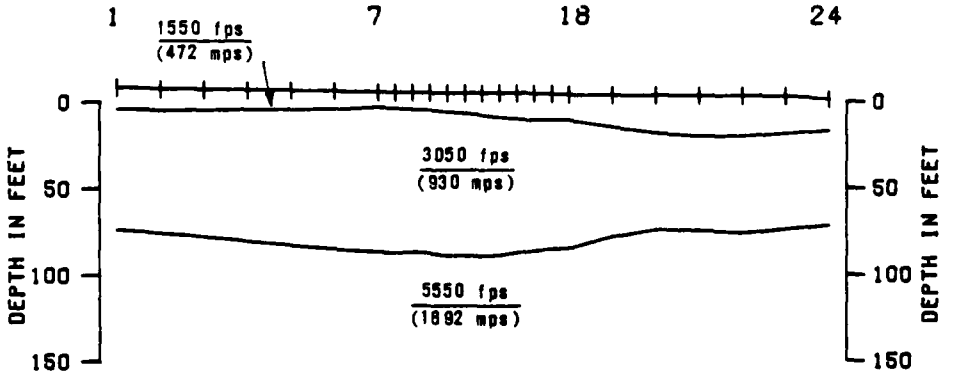
FIGURE
3-13

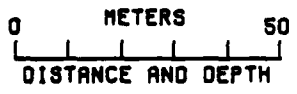
FUGRO NATIONAL, INC.

2 JUL 78

FN-TR-27-VIII







× TIMES TO RIGHT OF SHOTS
⊙ TIMES TO LEFT OF SHOTS

SEISMIC REFRACTION LINE S-S-14
TIME DISTANCE DATA AND VELOCITY PROFILE
VERIFICATION SITE, BIG SMOKY CDP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 3-14

FUGRO NATIONAL, INC.

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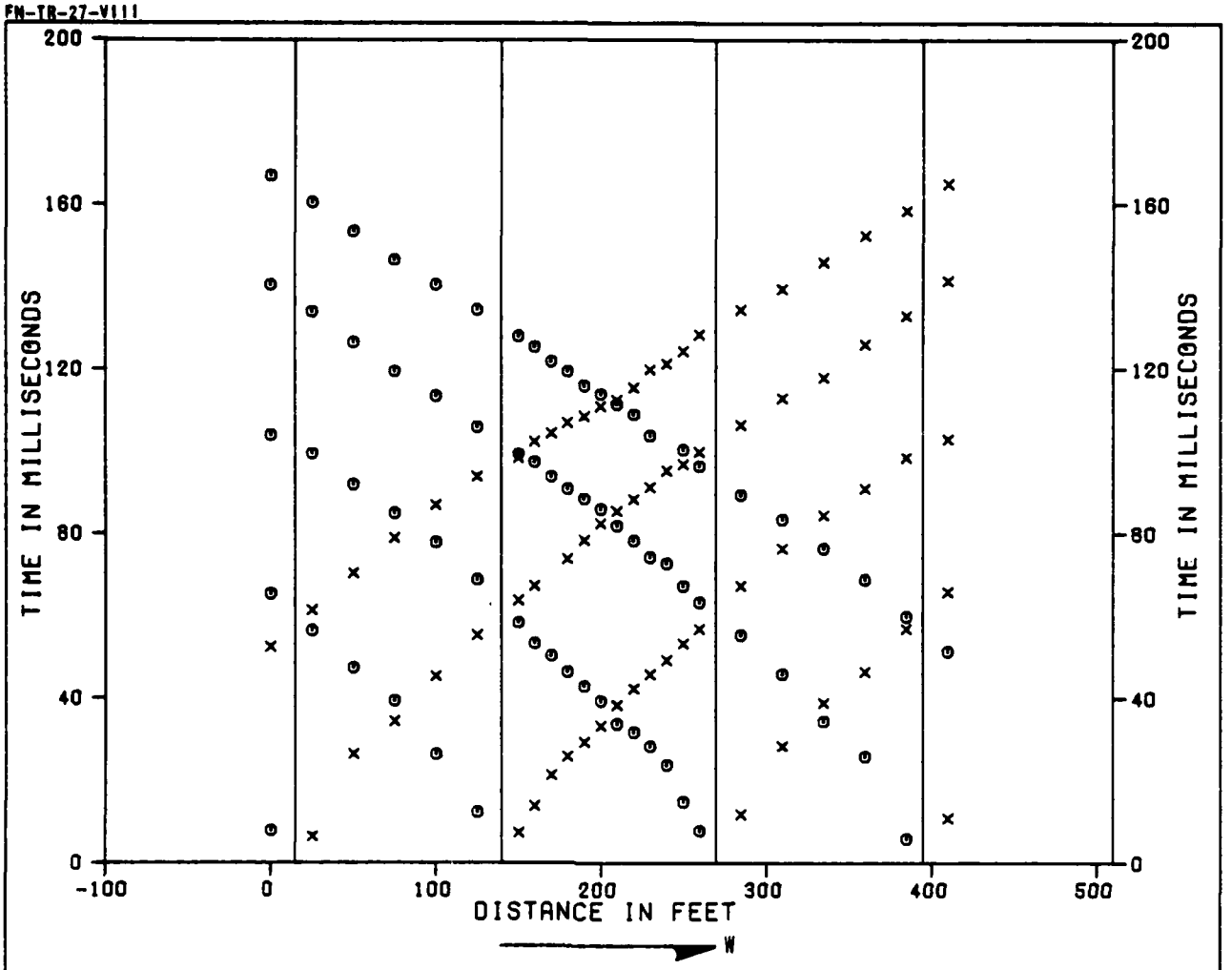
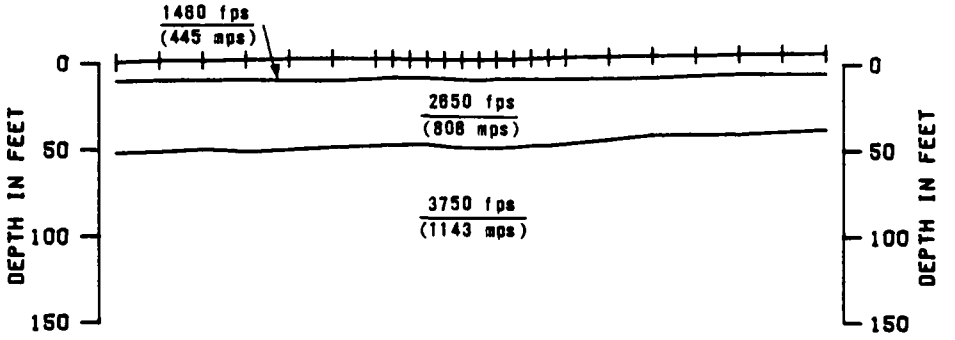
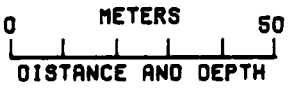






× TIMES TO RIGHT OF SHOTS
⊙ TIMES TO LEFT OF SHOTS

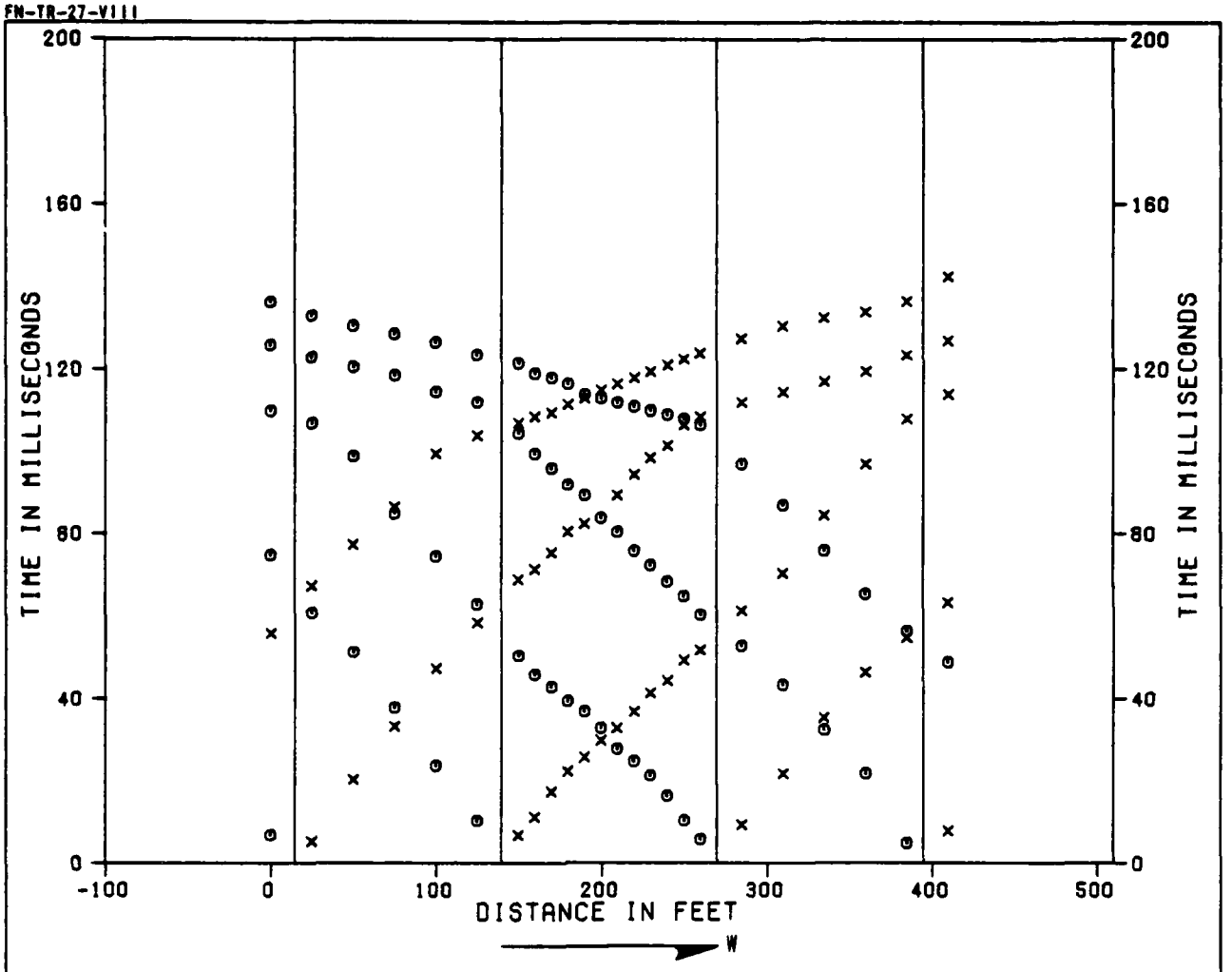
SEISMIC REFRACTION LINE BS-S-15
TIME DISTANCE DATA AND VELOCITY PROFILE
VERIFICATION SITE, BIG SMOKY COR, NEVADA

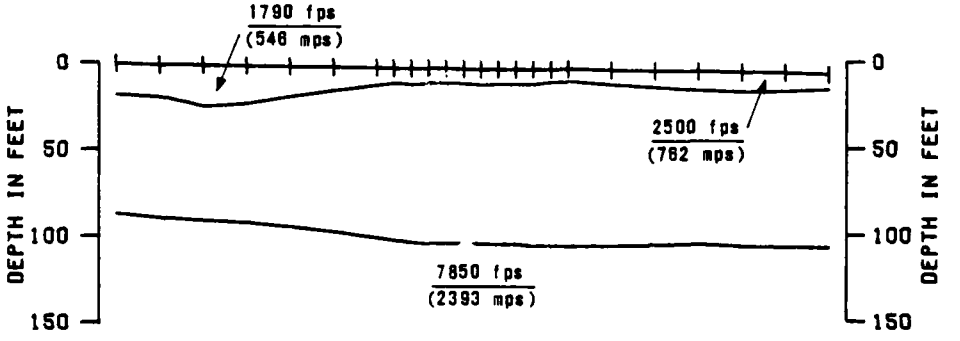
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

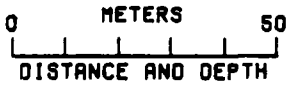
FIGURE
3-15

FUGRO NATIONAL, INC.

2 JUL 79







× TIMES TO RIGHT OF SHOTS
⊙ TIMES TO LEFT OF SHOTS

SEISMIC REFRACTION LINE BS-S-16
TIME DISTANCE DATA AND VELOCITY PROFILE
VERIFICATION SITE, BIG SMOKY CDP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 3-16

UGRO NATIONAL, INC.

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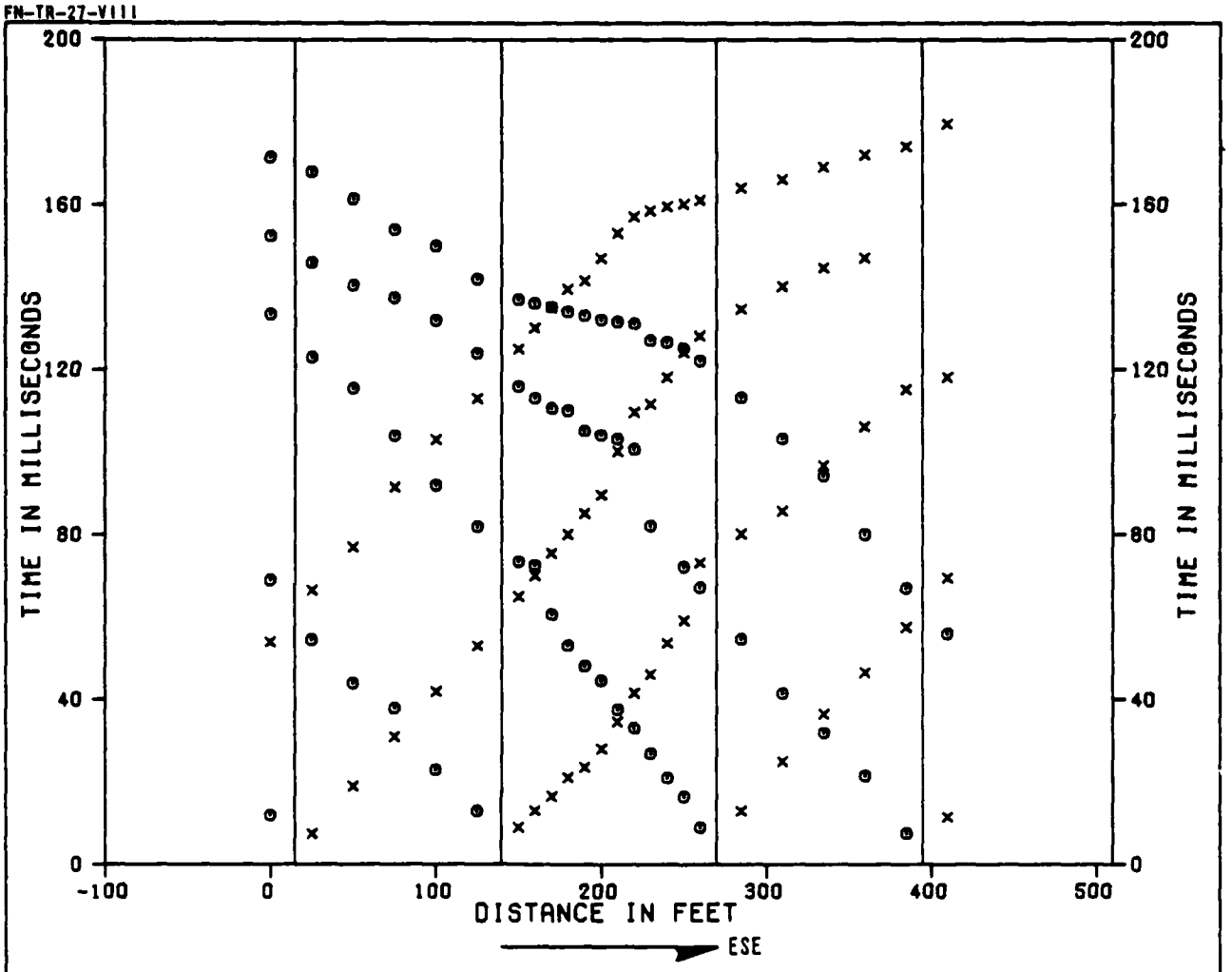


0 METERS 50

DISTANCE AND DEPTH

× TIMES TO RIGHT OF SHOTS

⊙ TIMES TO LEFT OF SHOTS

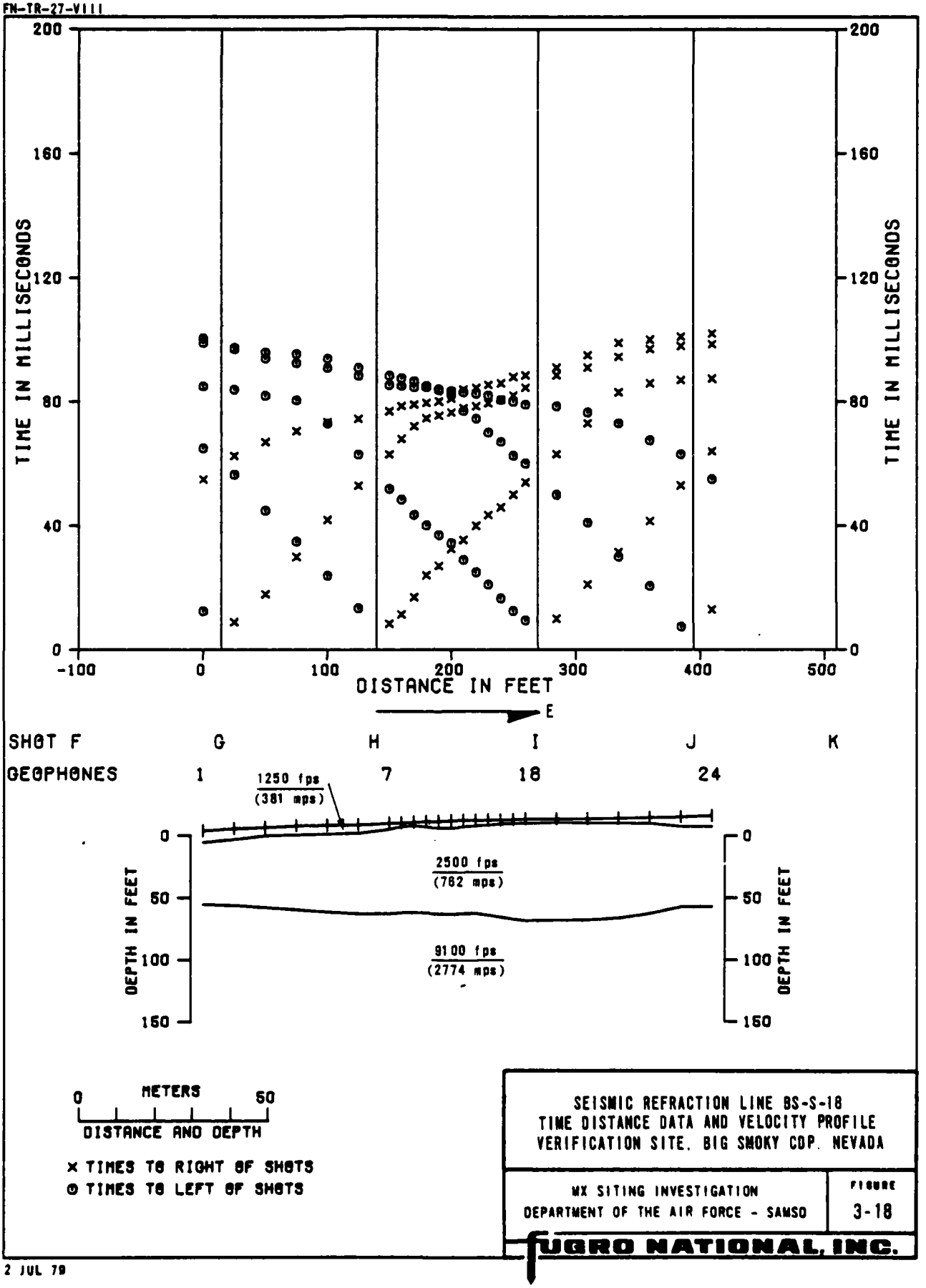
SEISMIC REFRACTION LINE BS-S-17
TIME DISTANCE DATA AND VELOCITY PROFILE
VERIFICATION SITE, BIG SMOKY CDP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 3-17

FUGRO NATIONAL, INC.

2 JUL 78



SEISMIC REFRACTION LINE BS-S-18
TIME DISTANCE DATA AND VELOCITY PROFILE
VERIFICATION SITE, BIG SMOKY COP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE
3-18

UGRO NATIONAL, INC.

2 JUL 79

SECTION 4.0

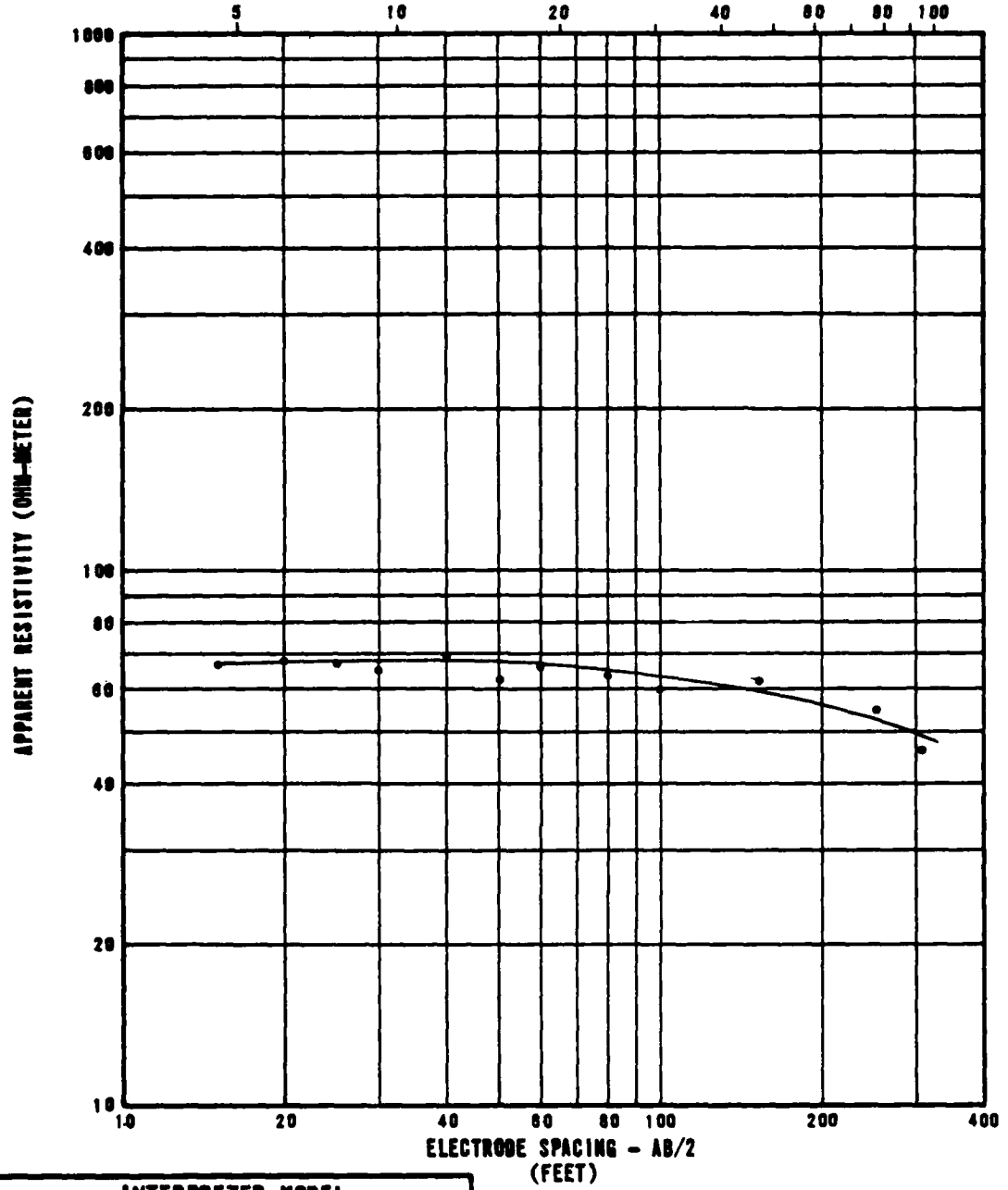
ELECTRICAL RESISTIVITY DATA

EXPLANATIONS OF ELECTRICAL RESISTIVITY DATA

Each figure in this section presents the data obtained from a resistivity sounding and a tabulated model of resistivity layers that would produce a curve similar to the observed curve.

The upper portion of the figures is a graph in which measured apparent resistivity values in ohm-meters are plotted versus one-half the distance between the current electrodes.

The interpreted model tabulated at the bottom of the page shows a combination of true resistivity layers and thicknesses obtained by matching theoretical curves to the field curve.



INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	65
250	76	10

RESISTIVITY SOUNDING BS-R-1
SOUNDING CURVE AND INTERPRETATION
VERIFICATION SITE, BIG SMOKY COP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE
4-1

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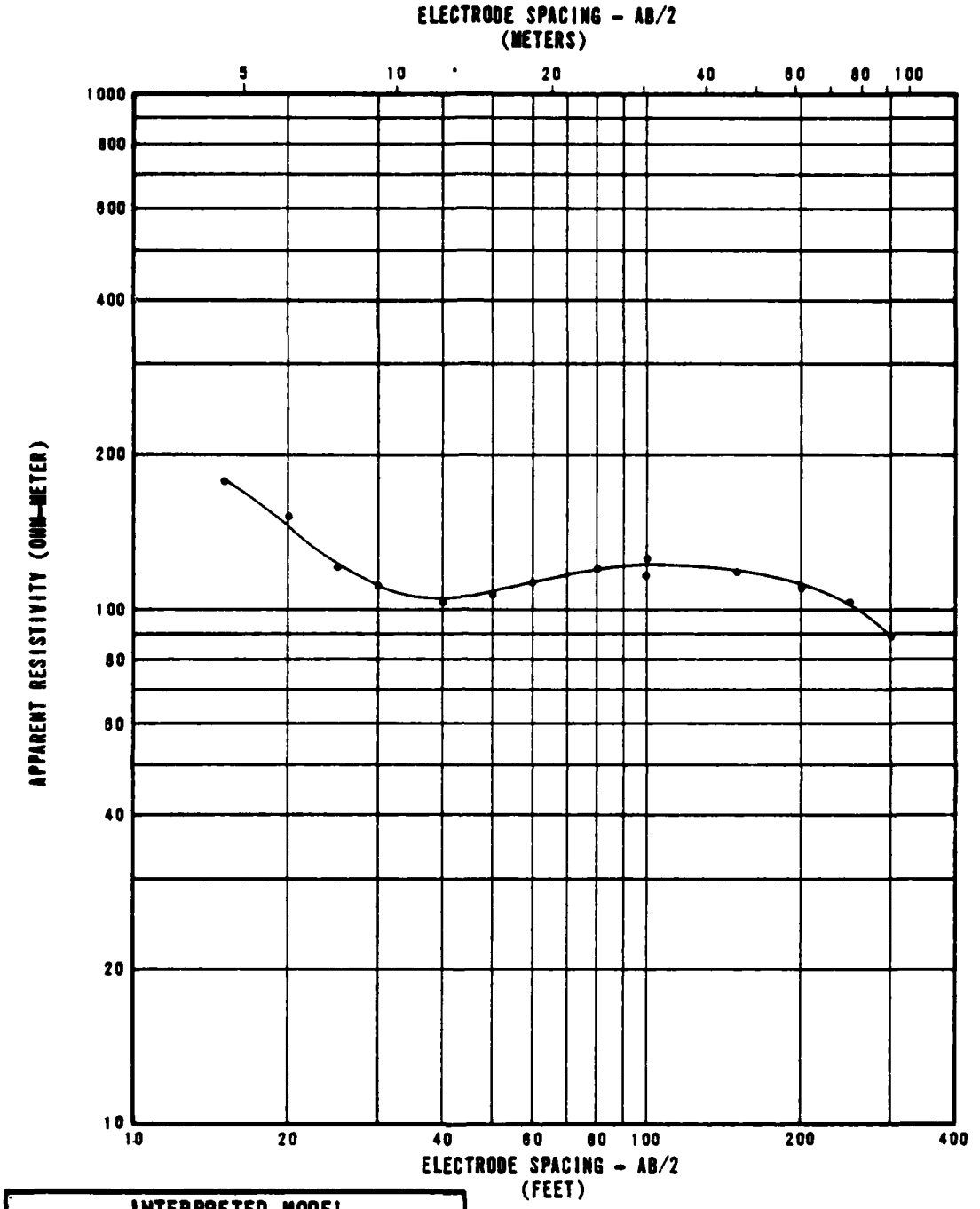


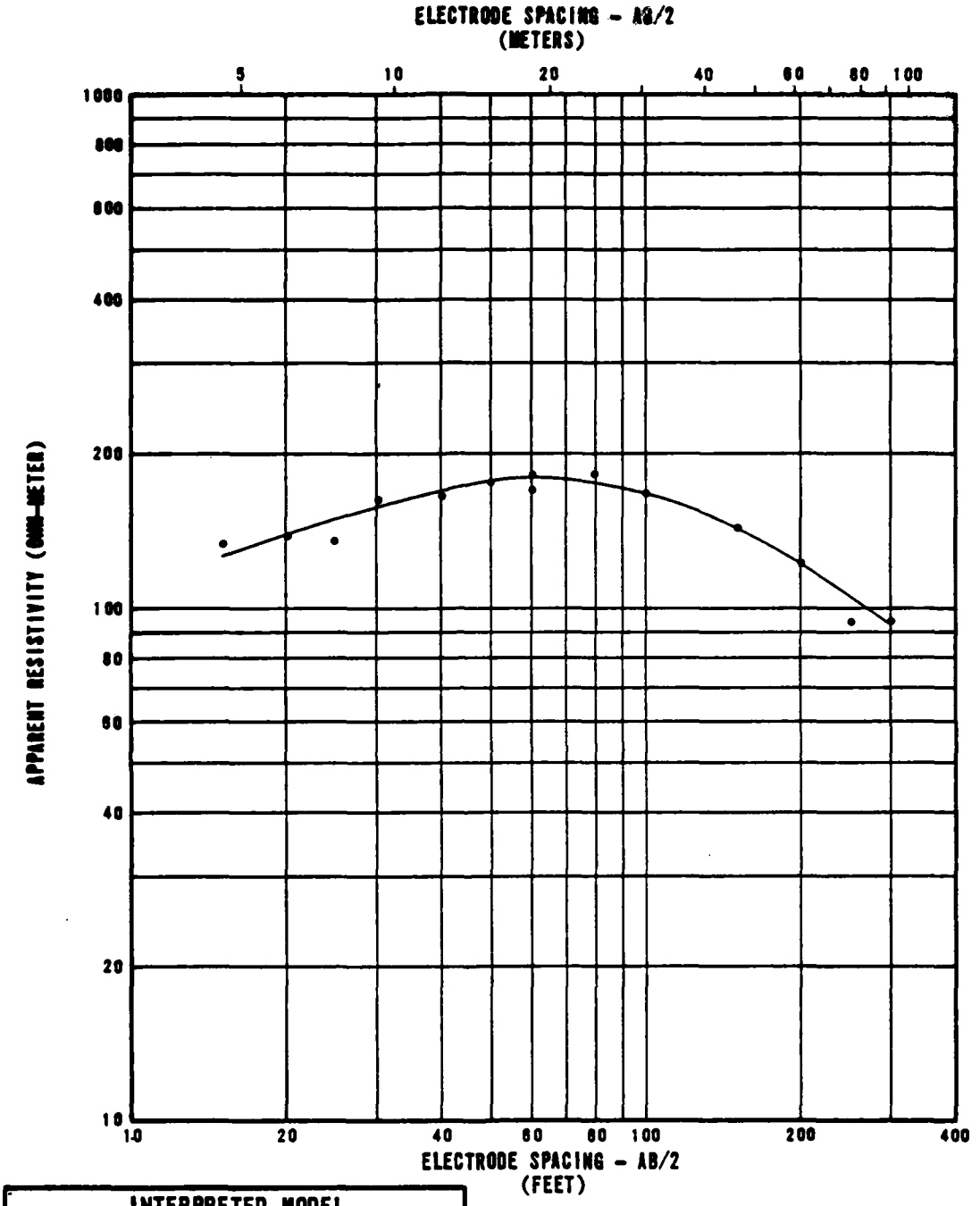
INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	250
8	2	85
18	5	150
102	31	80

RESISTIVITY SOUNDING BS-R-2
SOUNDING CURVE AND INTERPRETATION
VERIFICATION SITE, BIG SMOKY CDP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE
4-2

FUGRO NATIONAL, INC.



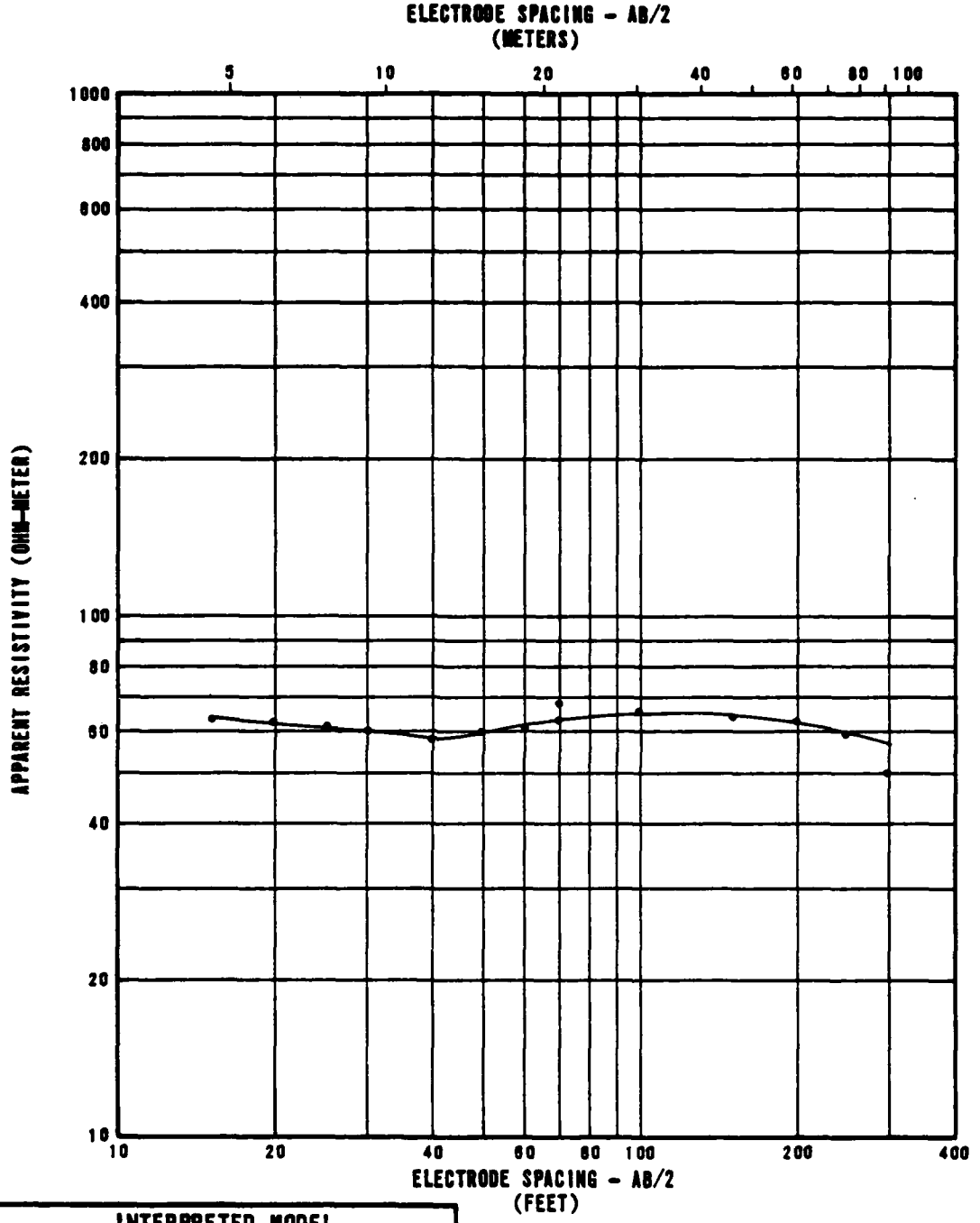
INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	110
10	3	220
61	19	80

RESISTIVITY SOUNDING BS-R-3
SOUNDING CURVE AND INTERPRETATION
VERIFICATION SITE, BIG SMOKY CDP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE
4-3

FUGRO NATIONAL, INC.



INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	75
120	37	40

RESISTIVITY SOUNDING BS-R-4
SOUNDING CURVE AND INTERPRETATION
VERIFICATION SITE, BIG SMOKY CDP, NEVADA

MX SITING INVESTIGATION
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FIGURE
4-4

FUGRO NATIONAL, INC.

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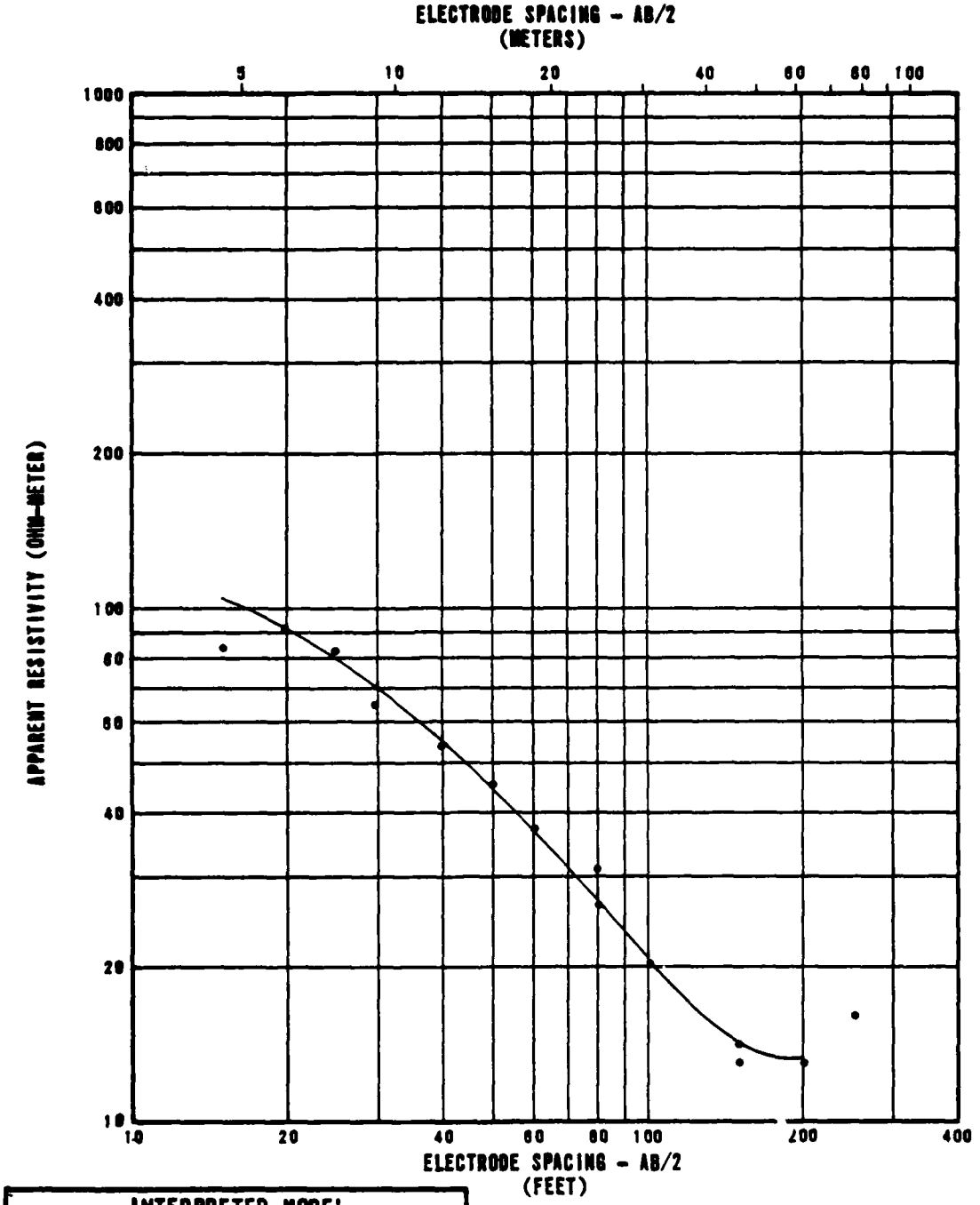


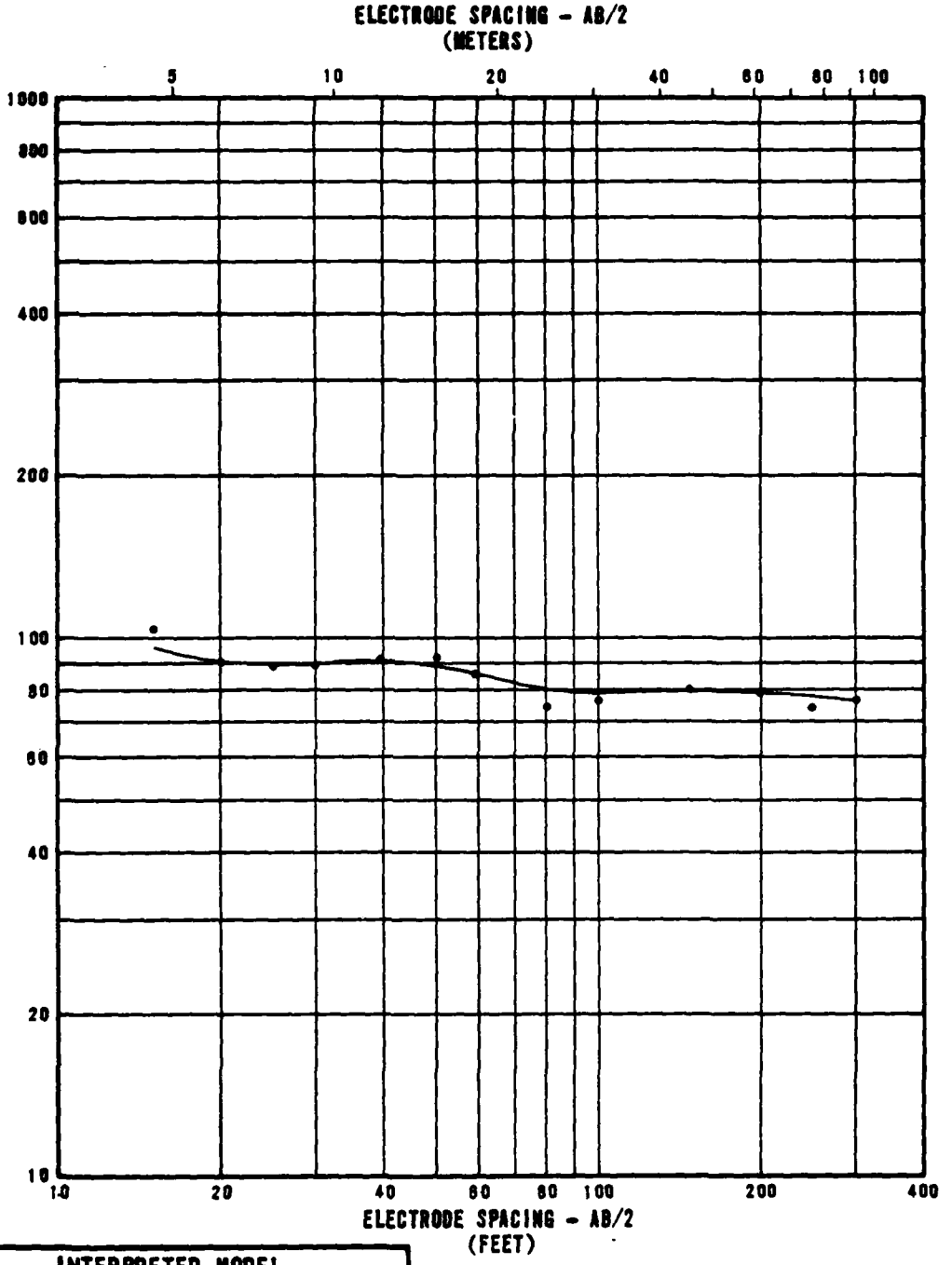
INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	120
14	4	20

RESISTIVITY SOUNDING BS-R-5
SOUNDING CURVE AND INTERPRETATION
VERIFICATION SITE, BIG SMOKY COP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE
4-5

FUGRO NATIONAL, INC.



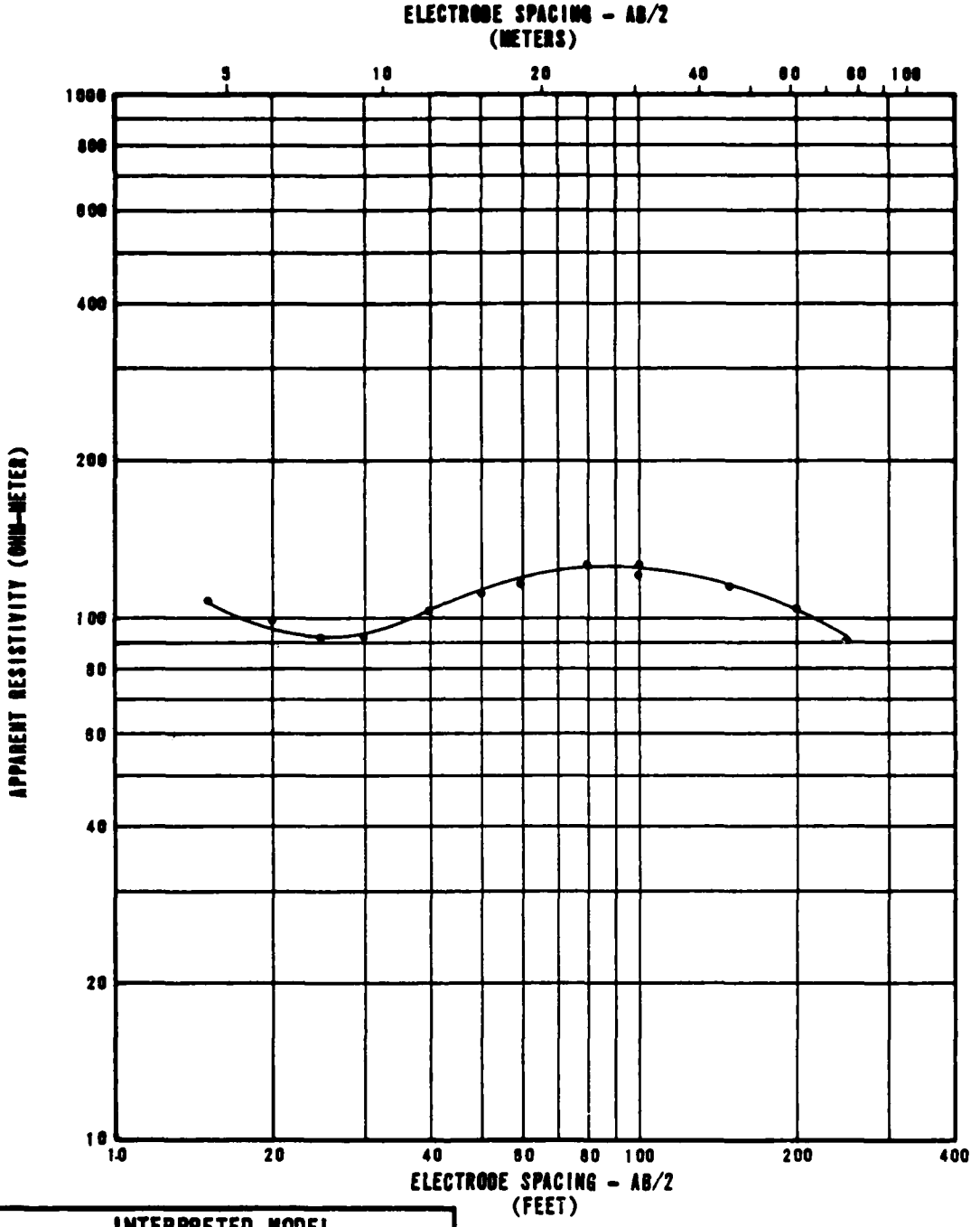
INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	110
31	9	60
82	25	130
137	42	65

RESISTIVITY SOUNDING BS-R-6
SOUNDING CURVE AND INTERPRETATION
VERIFICATION SITE, BIG SMOKY CDP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 4-6

FUGRO NATIONAL, INC.



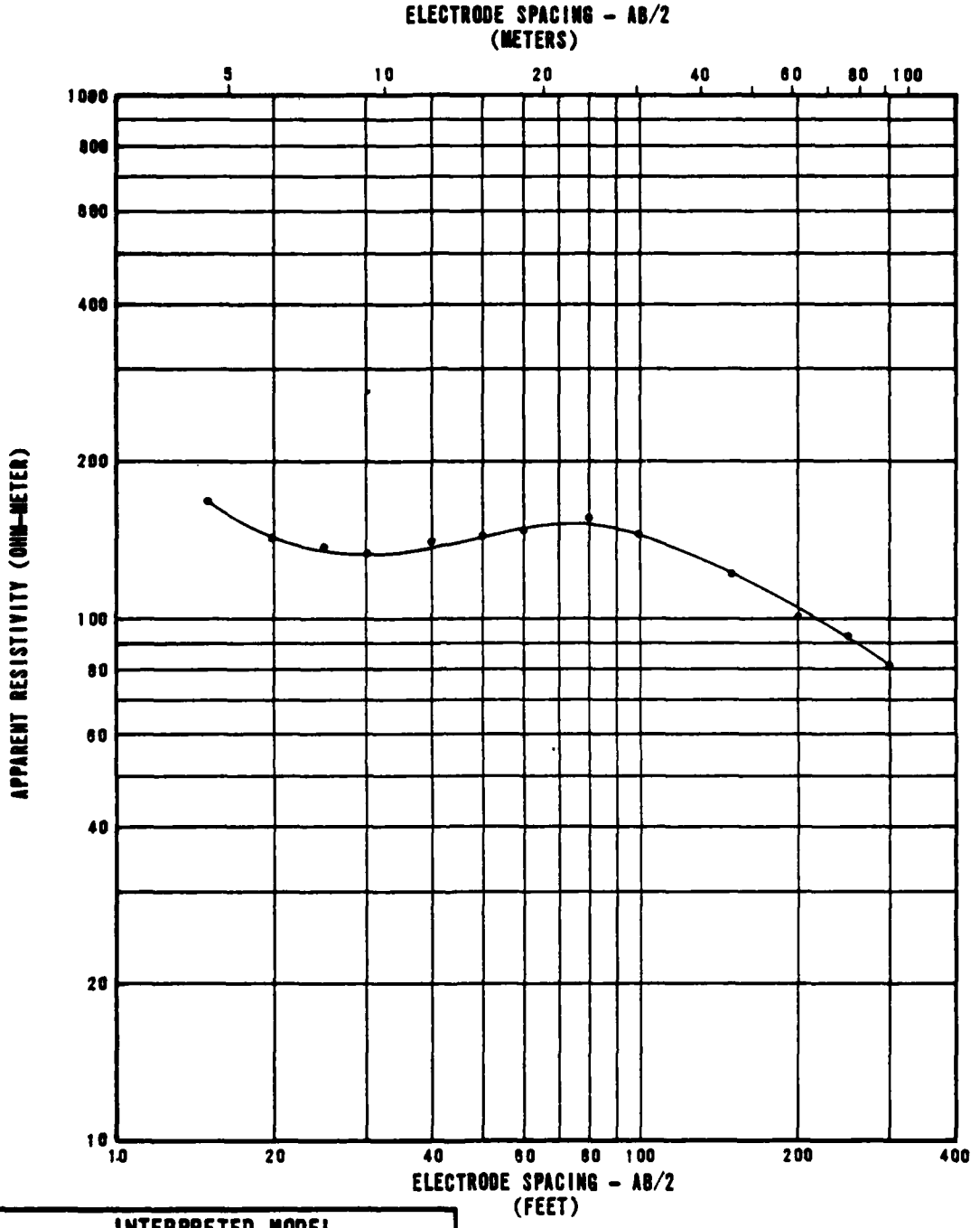
INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	160
5	2	80
25	8	580
35	11	70

RESISTIVITY SOUNDING BS-R-7
SOUNDING CURVE AND INTERPRETATION
VERIFICATION SITE, BIG SMOKY CDP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE
4-7

FUGRO NATIONAL, INC.



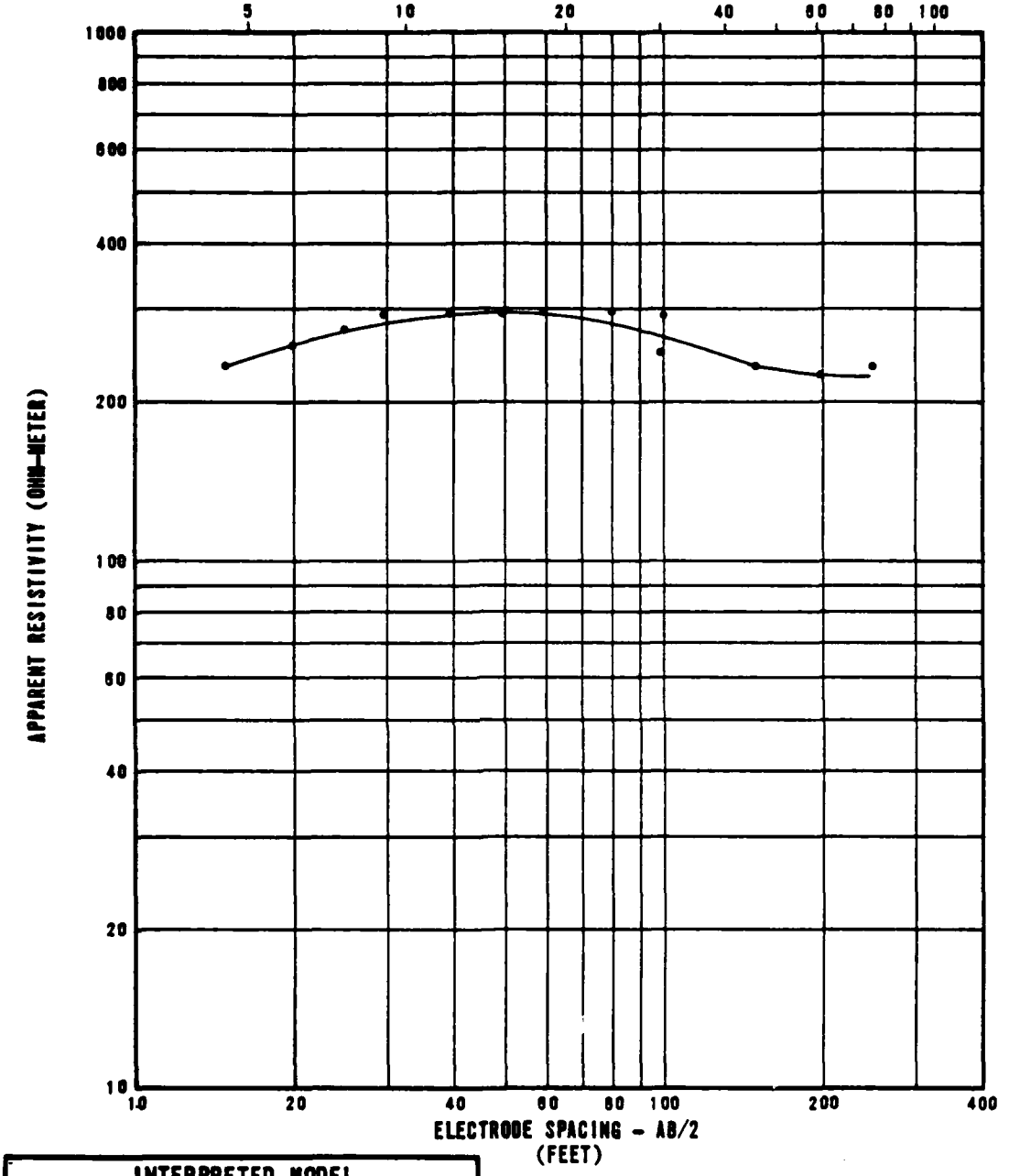
INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	220
8	2	95
23	7	290
53	16	65

RESISTIVITY SOUNDING BS-R-8
SOUNDING CURVE AND INTERPRETATION
VERIFICATION SITE, BIG SMOKY COP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE
4-8

FUGRO NATIONAL, INC.



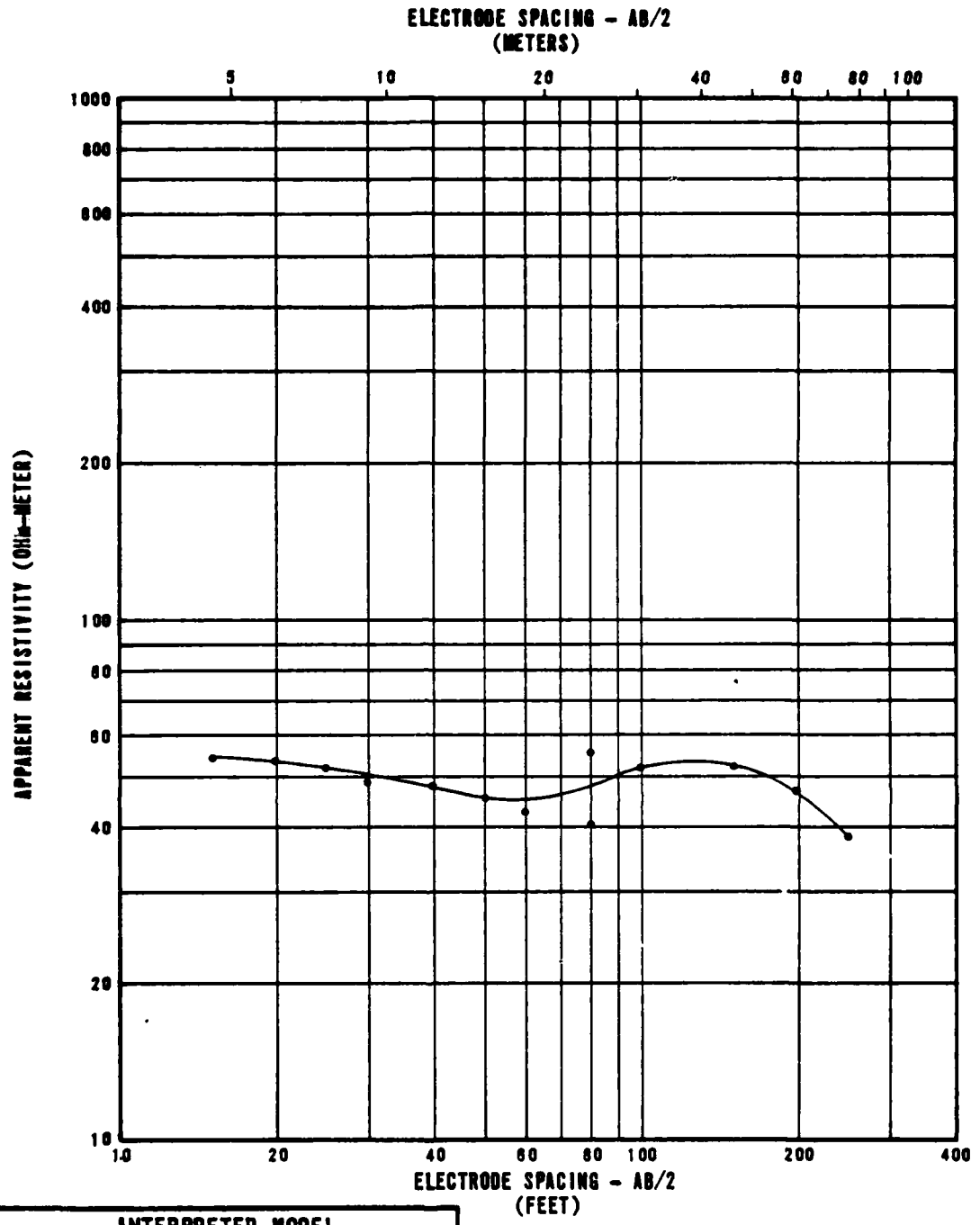
INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	210
7	2	340
46	14	140
99	30	280

RESISTIVITY SOUNDING BS-R-9
SOUNDING CURVE AND INTERPRETATION
VERIFICATION SITE, BIG SMOKY CDP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 4-9

FUGRO NATIONAL, INC.



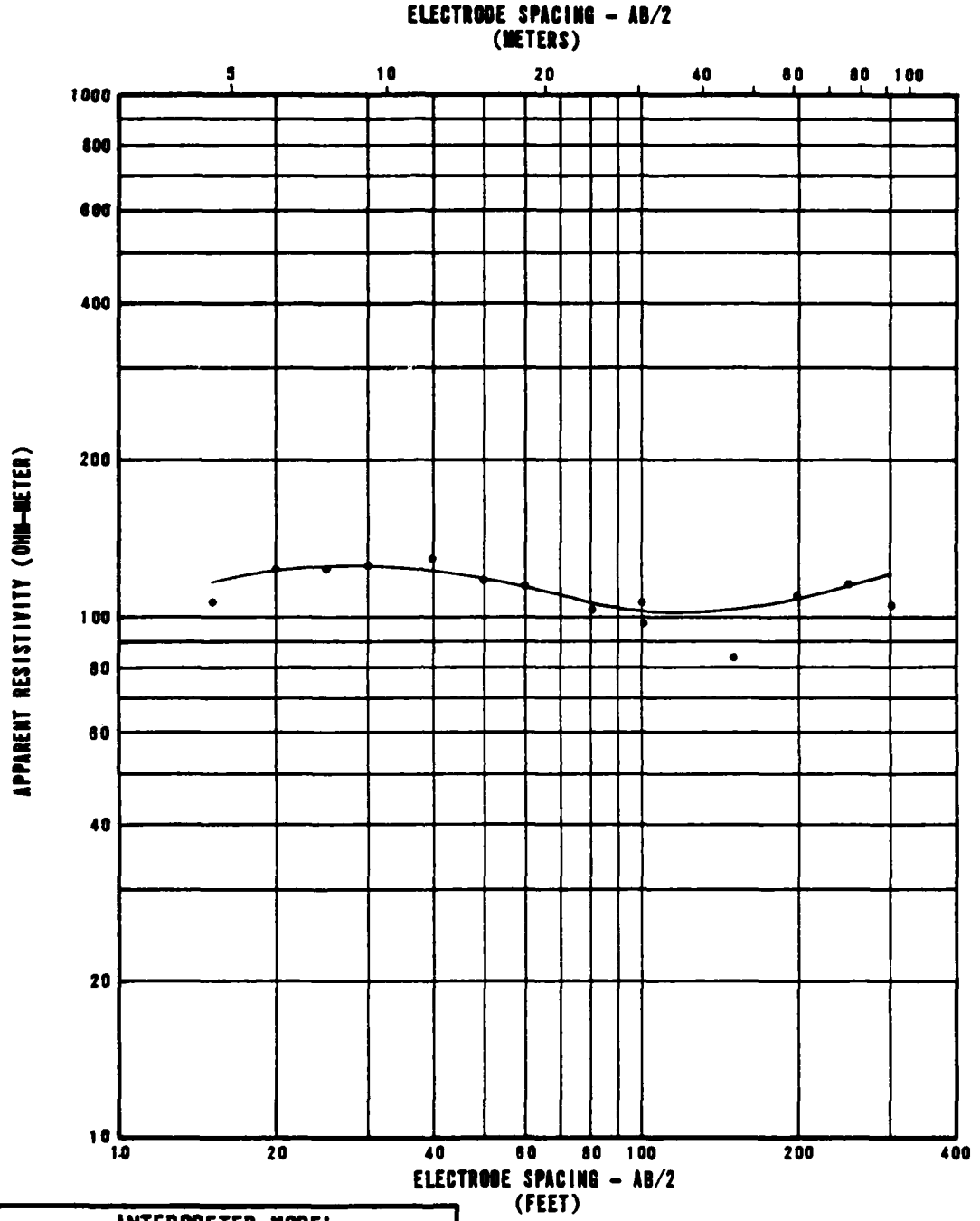
INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	45
40	12	85
114	35	13

RESISTIVITY SOUNDING BS-R-10
SOUNDING CURVE AND INTERPRETATION
VERIFICATION SITE, BIG SMOKY COP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE
4-10

FUGRO NATIONAL, INC.



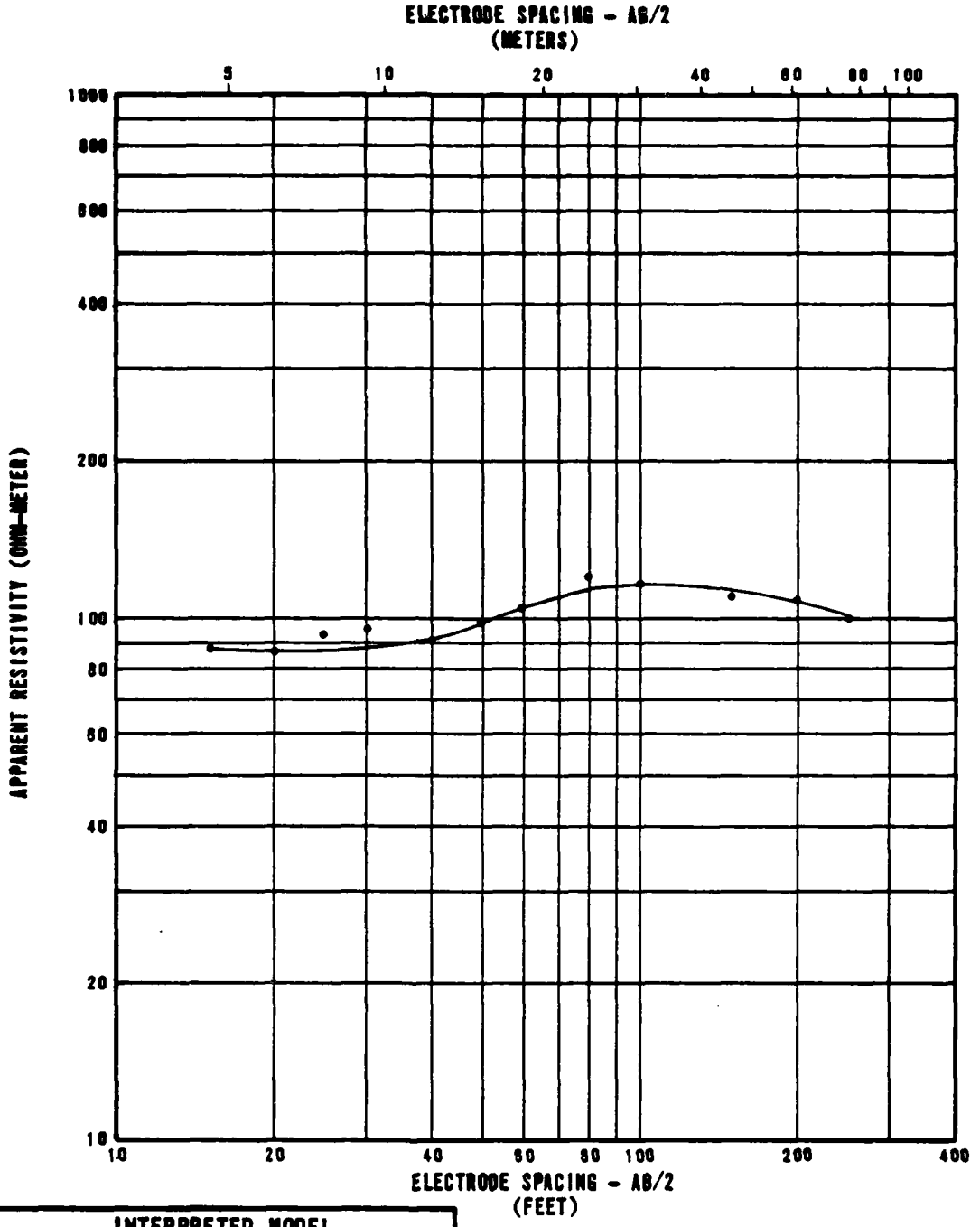
INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	140
27	8	75
102	31	210
182	55	140

RESISTIVITY SOUNDING BS-R-11
SOUNDING CURVE AND INTERPRETATION
VERIFICATION SITE, BIG SMOKY COP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE
4-11

FUGRO NATIONAL, INC.



INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	90
30	9	160
98	30	60

RESISTIVITY SOUNDING BS-R-12
SOUNDING CURVE AND INTERPRETATION
VERIFICATION SITE, BIG SMOKY COP, NEVADA

MX SITING INVESTIGATION
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FIGURE
4-12

FUGRO NATIONAL, INC.

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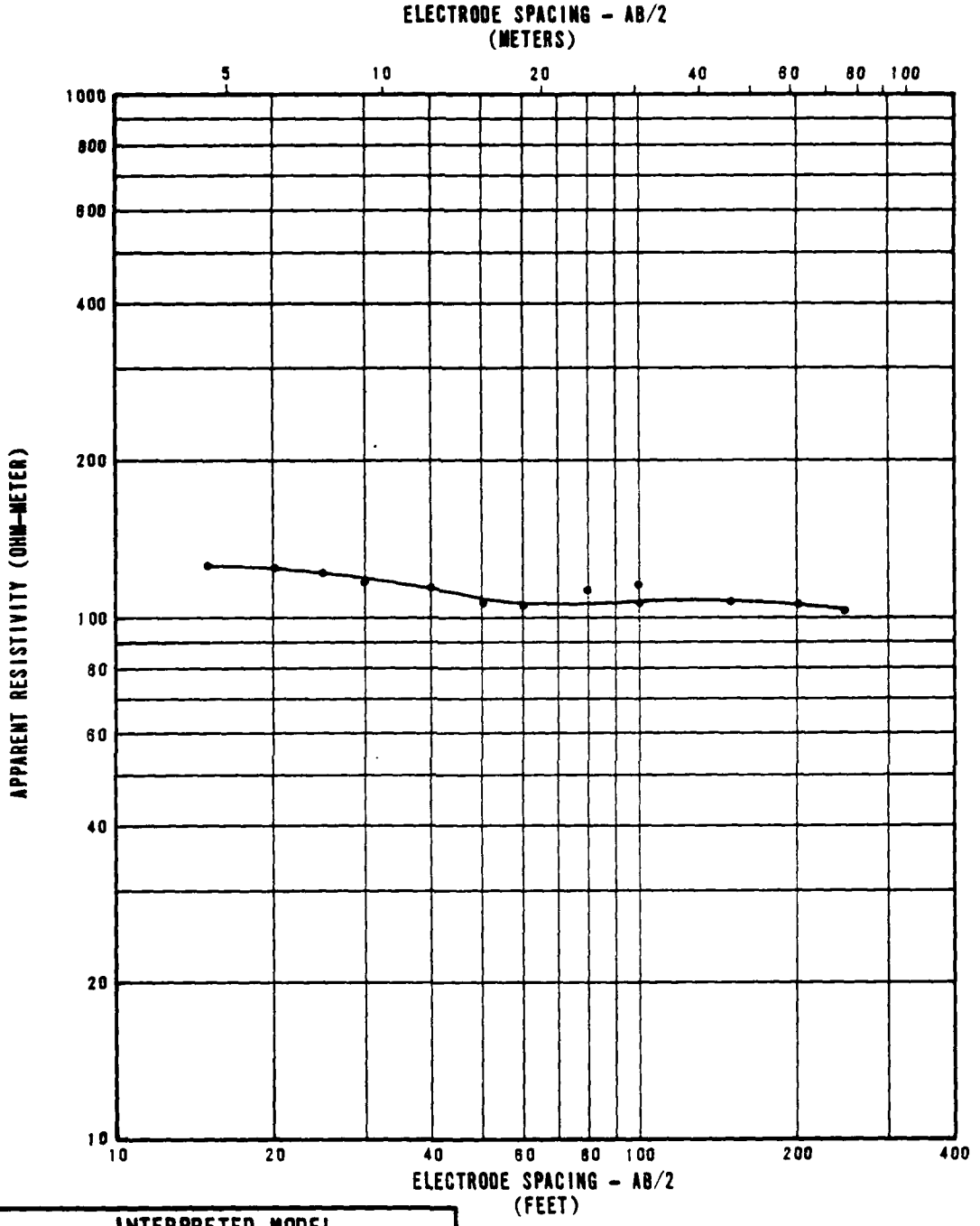


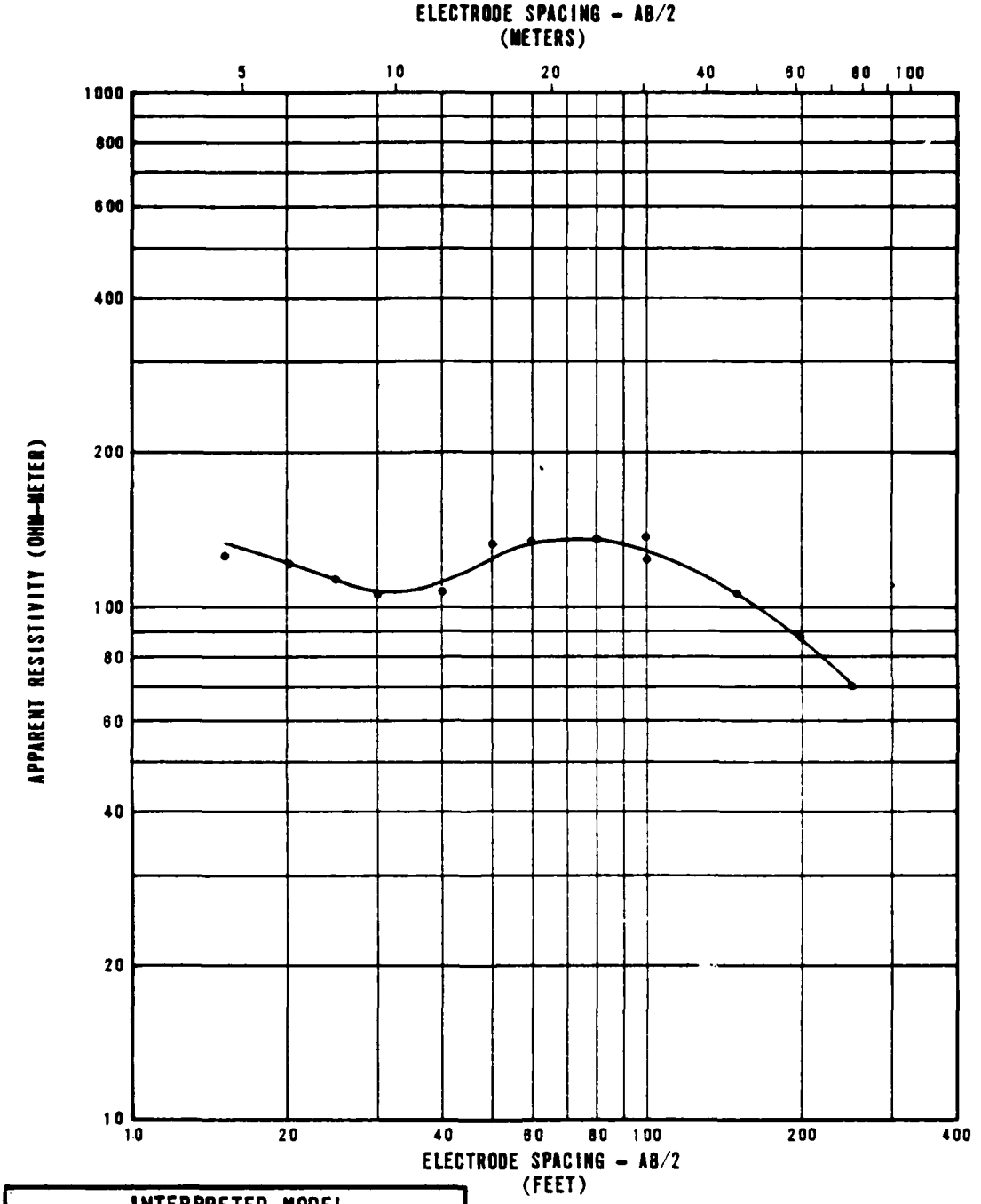
INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	130
23	7	90
69	21	130
194	59	80

RESISTIVITY SOUNDING BS-R-13
SOUNDING CURVE AND INTERPRETATION
VERIFICATION SITE, BIG SMOKY COP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE
4-13

UGRO NATIONAL, INC.



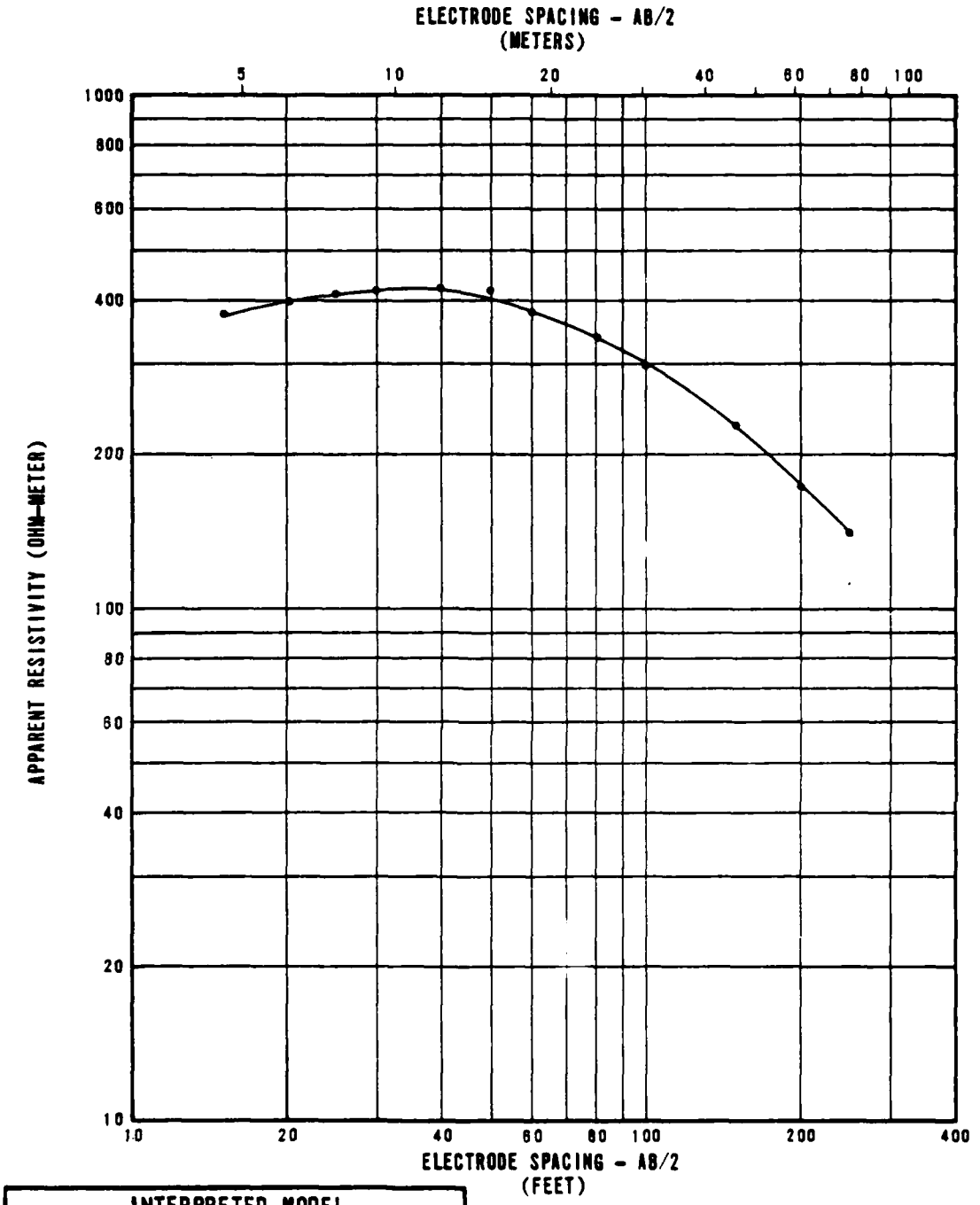
INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	180
6	2	90
27	8	610
34	10	130
78	24	35

RESISTIVITY SOUNDING BS-R-14
SOUNDING CURVE AND INTERPRETATION
VERIFICATION SITE, BIG SMOKY COP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE
4-14

FUGRO NATIONAL, INC.



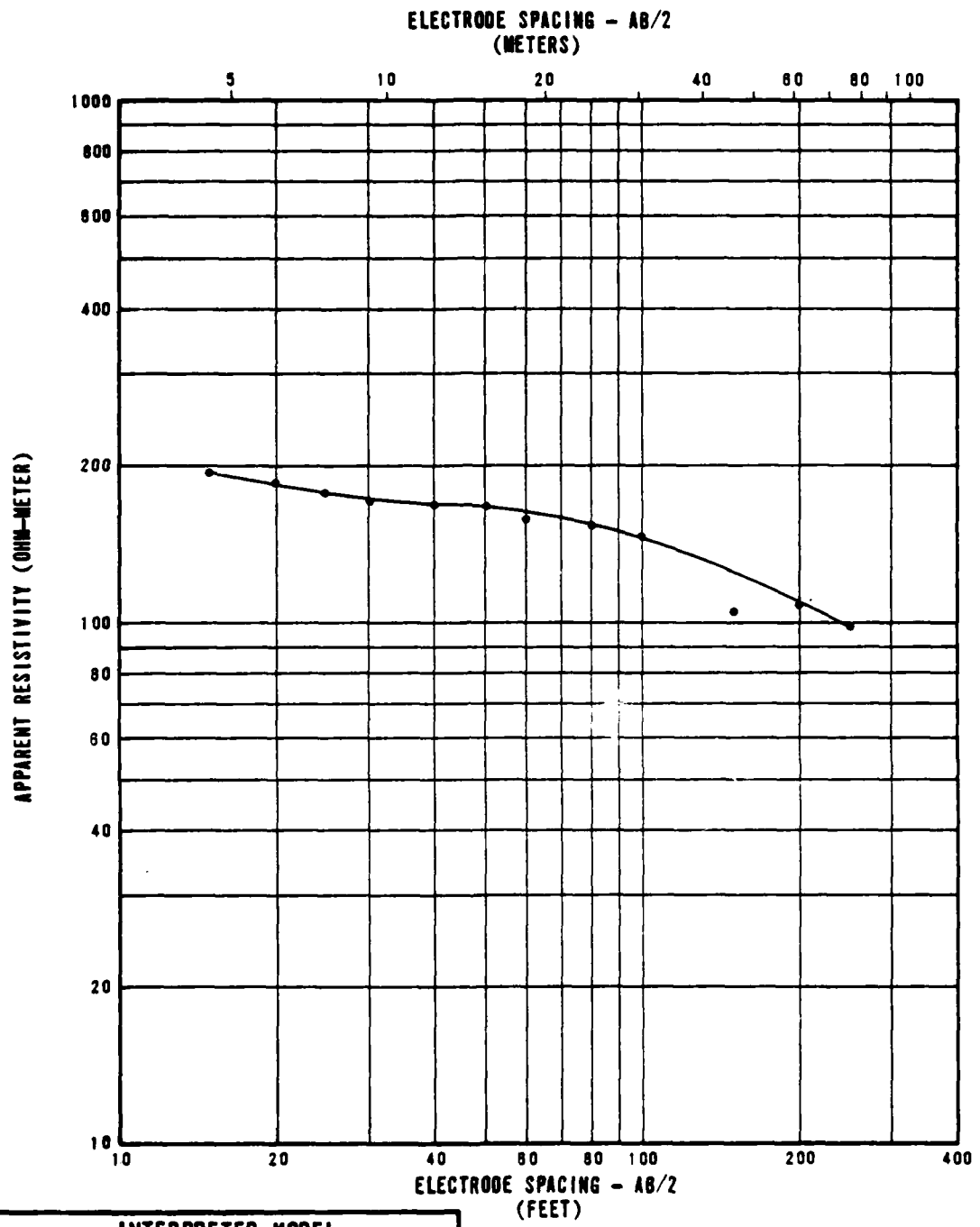
INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	360
12	4	580
35	11	170
188	57	35

RESISTIVITY SOUNDING BS-R-15
SOUNDING CURVE AND INTERPRETATION
VERIFICATION SITE, BIG SMOKY COP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE
4-15

FUGRO NATIONAL, INC.



INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	200
13	4	150
36	11	190
76	23	70

RESISTIVITY SOUNDING BS-R-16
SOUNDING CURVE AND INTERPRETATION
VERIFICATION SITE, BIG SMOKY COP, NEVADA

MX SITING INVESTIGATION
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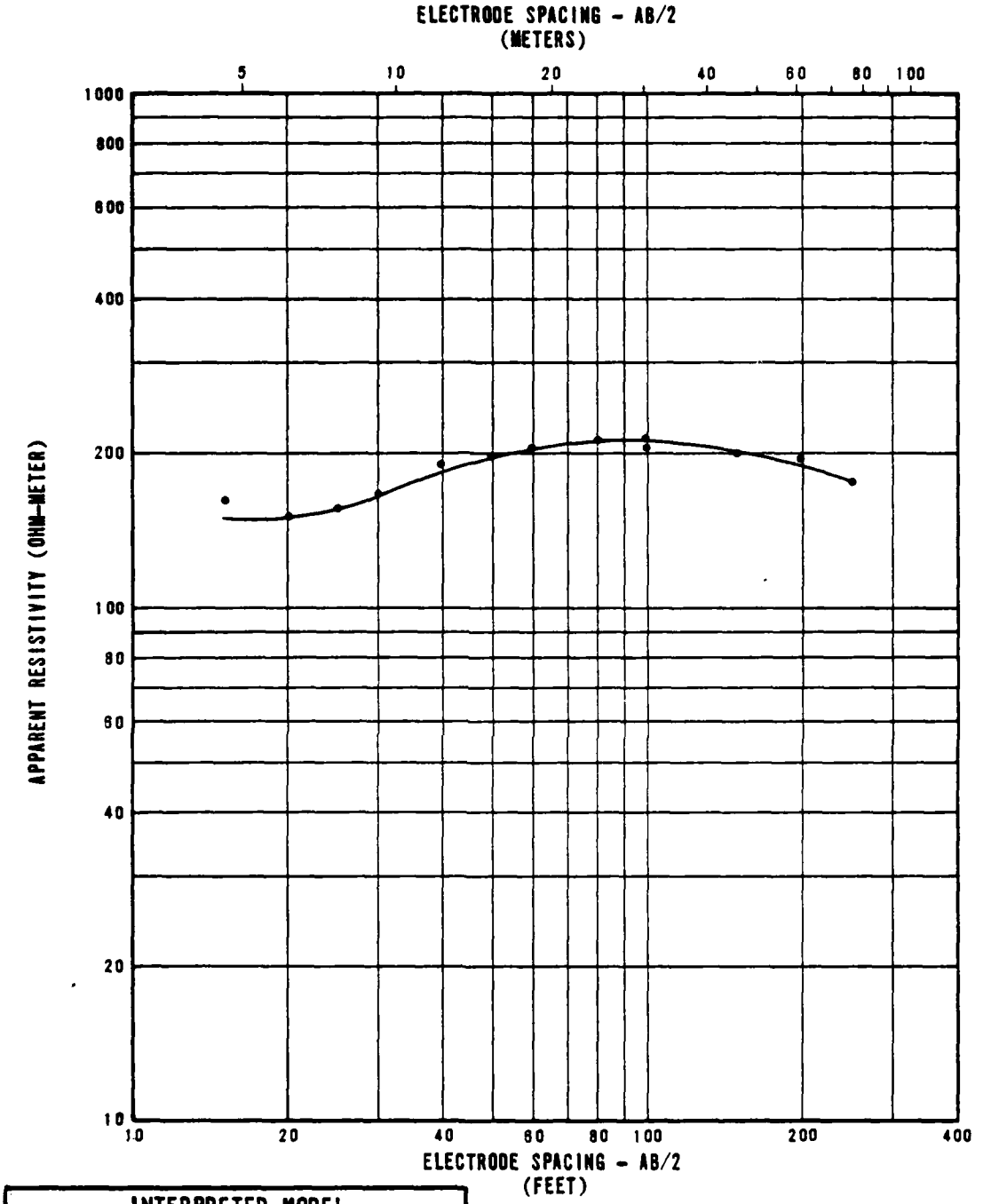
FIGURE
4-16

FUGRO NATIONAL, INC.



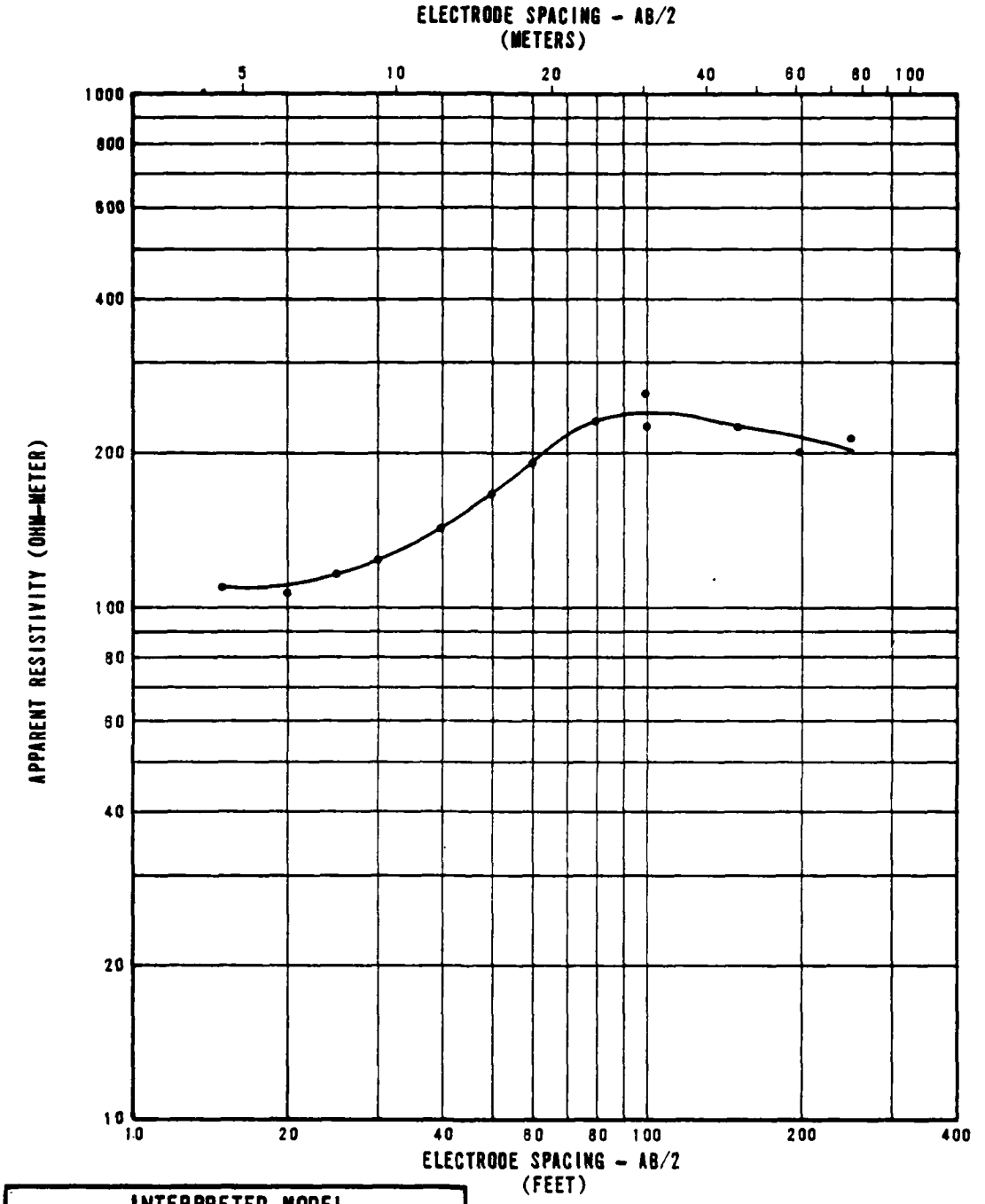
INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	140
17	5	360
42	13	160

RESISTIVITY SOUNDING BS-R-17
SOUNDING CURVE AND INTERPRETATION
VERIFICATION SITE, BIG SMOKY CDP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE
4-17

FUGRO NATIONAL, INC.



INTERPRETED MODEL		
LAYER DEPTH		RESISTIVITY VALUES
FEET	METERS	OHM-METER
0	0	100
22	7	580
66	20	110

RESISTIVITY SOUNDING BS-R-18
SOUNDING CURVE AND INTERPRETATION
VERIFICATION SITE, BIG SMOKY CDP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE
4-18

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SECTION 5.0

GRAVITY DATA

EXPLANATIONS OF GRAVITY DATA

Gravity data were not available in time (prior to June 1979) for incorporation into this report. A supplemental report containing gravity data and results will be issued at a later date.

SECTION 6.0

BORING LOGS

EXPLANATIONS OF BORING, TRENCH, AND TEST PIT LOGS

All data from borings, trenches, and test pits are presented on standard Fugro National logs in Sections 6.0 and 7.0. The following explanations are provided as a key to the logs.

A. Designations - Borings, trenches, and test pits are identified as follows:

WW-B-1
WW - abbreviation for the site (e.g., WW-Whirlwind)
B - abbreviation for activity (e.g., B-boring, T-trench, P-test pit)
1 - number of activity

B. Sample Type - Different sampling techniques were used and the symbols are explained at the bottom of the boring logs. For details of sampling techniques, see Section A5.0 of Appendix in Volume I. Horizontal lines, to scale, indicate the depth where sampling was attempted.

C. Percent Recovery - The numbers shown represent the ratio (in percent) of the soil sample recovered in the sampler to the full penetration of the sampler.

D. N Value - Corresponds to standard penetration resistance, which is number of blows required to drive a standard split-spoon sampler for the second and third of three 6-inch (15 cm) increments with a 140-pound (63.5 kg) hammer falling 30 inches (76 cm) (ASTM D 1586-67).

E. Depth - Corresponds to depth below ground surface in meters and feet.

F. Lithology - Graphic representation of the soil and rock types.

G. USCS - Unified Soil Classification System (see Table 6-1 for complete details) symbols.

H. Soil Description - Except in cases where samples were classified based on laboratory test data, the descriptions are based on visual classification. The procedures outlined in ASTM D 2487-69, Classification of Soils for Engineering Purposes, and D 2488-69, Description of Soils (Visual-Manual Procedure) were followed. Solid lines across the column indicate known change in strata at the depth shown.

Definitions of some of the terms and criteria to describe soils and conditions encountered during the exploration follow.

Gradation : A coarse-grained soil is well graded if it has a wide range in grain size and substantial amounts of most intermediate particle sizes.

Poorly graded indicates that the soil consists predominantly of one size (uniformly graded) or has a wide range of sizes with some intermediate sizes obviously missing (gap-graded).

Moisture :

Dry	- no feel of moisture
Slightly Moist	- much less than normal moisture
Moist	- normal moisture for soil
Very Moist	- much greater than normal moisture
Wet	- for soils below the water table (if known)

SECTION 6.0

BORING LOGS

Field Identification Procedures (Excluding particles larger than 3 in. and basing fractions on estimated weights)		Group Symbols[a]	Typical Names	Information Required for Describing Soils	Laboratory Classification Criteria
Coarse-grained soils More than half of material is larger than No. 200 sieve size[b]	Gravels More than half of coarse fraction is larger than No. 4 sieve size (For visual classification, the ½ in. size may be used as equivalent to the No. 4 sieve size)	Clean gravels (little or no fines)	Wide range in grain size and substantial amounts of all intermediate particle sizes	GW	Well graded gravels, gravel-sand mixtures, little or no fines	Give typical name; indicate approximate percentages of sand and gravel; maximum size; angularity, surface condition, and hardness of the coarse grains; local or geologic name and other pertinent descriptive information; and symbols in parentheses For undisturbed soils add information on stratification, degree of compactness, cementation, moisture conditions and drainage characteristics Example: *Silty sand, gravelly*, about 20% hard, angular gravel particles ½-in. maximum size; rounded and subangular sand grains coarse to fine, about 15% non-plastic fines with low dry strength; well compacted and moist in place; alluvial sand; (SM)	$C_U = \frac{D_{60}}{D_{10}}$ Greater than 4 $C_C = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ Between 1 and 3
			Predominantly one size or a range of sizes with some intermediate sizes missing	GP	Poorly graded gravels, gravel-sand mixtures, little or no fines		Not meeting all gradation requirements for GW
		Gravels with fines (appreciable amount of fines)	Nonplastic fines (for identification procedures see ML below)	GM	Silty gravels, poorly graded gravel-sand-silt mixtures		Atterberg limits below "A" line, or PI less than 4	Above "A" line with PI between 4 and 7 are borderline cases requiring use of dual symbols
			Plastic fines (for identification procedures, see CL below)	GC	Clayey gravels, poorly graded gravel-sand-clay mixtures		Atterberg limits above "A" line, with PI greater than 7	
	Sands More than half of coarse fraction is smaller than No. 4 sieve size	Clean sands (little or no fines)	Wide range in grain sizes and substantial amounts of all intermediate particle sizes	SW	Well graded sands, gravelly sands, little or no fines	$C_U = \frac{D_{60}}{D_{10}}$ Greater than 6 $C_C = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ Between 1 and 3	
			Predominantly one size or a range of sizes with some intermediate sizes missing	SP	Poorly graded sands, gravelly sands, little or no fines		Not meeting all gradation requirements for SW
		Sands with fines (appreciable amount of fines)	Nonplastic fines (for identification procedures, see ML below)	SM	Silty sands, poorly graded sand-silt mixtures	Determine percentages of sand and gravel from grain size curve Depending on percentage of fines (fraction smaller than No. 200 sieve size) coarse grained soils are classified as follows: Less than 5%: GW, GP, SW, SP More than 12%: GM, GC, SM, SC 5% to 12%: Borderline cases requiring use of dual symbols	Atterberg limits below "A" line or PI less than 4	Above "A" line with PI between 4 and 7 are borderline cases requiring use of dual symbols
			Plastic fines (for identification procedures, see CL below)	SC	Clayey sands, poorly graded sand-clay mixtures		Atterberg limits above "A" line with PI greater than 7	
Fine-grained soils More than half of material is smaller than No. 200 sieve size (The No. 200 sieve size is about the smallest particle visible to the naked eye)	Identification Procedures on Fraction Smaller than No. 40 Sieve Size					Use grain size curve in identifying the fractions as given under field identification	
	Silts and clays liquid limit less than 50	Dry Strength (crushing characteristics)	Dilatancy (reaction to shaking)	Toughness (consistency near plastic limit)			
		None to slight	Quick to slow	None	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands with slight plasticity	Give typical name; indicate degree and character of plasticity; amount and maximum size of coarse grains; colour in wet condition, odour if any, local or geologic name, and other pertinent descriptive information, and symbol in parentheses For undisturbed soils add information on structure, stratification, consistency in undisturbed and remolded states, moisture and drainage conditions Example: *Clayey silt*, brown, slightly plastic, small percentage of fine sand, numerous vertical root holes, *firm and dry in place*, loess, (ML)	Plasticity chart for laboratory classification of fine grained soils
		Medium to high	None to very slow	Medium	CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays		
		Slight to medium	Slow	Slight	OL	Organic silts and organic silty clays of low plasticity		
	Silts and clays liquid limit greater than 50	Slight to medium	Slow to none	Slight to medium	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts		
		High to very high	None	High	CH	Inorganic clays of high plasticity, fat clays		
		Medium to high	None to very slow	Slight to medium	OH	Organic clays of medium to high plasticity		
Highly Organic Soils		*Readily identified by colour, odour, spongy feel and frequently by fibrous texture*			Pt	Peat and other highly organic soils		

From Wagner, 1957.

a Boundary classifications: Soils possessing characteristics of two groups are designated by combinations of group symbols. For example GW-GC, well graded gravel-sand mixture with clay binder.

b All sieve sizes on this chart are U.S. standard.

Field Identification Procedures for Fine Grained Soils or Fractions

These procedures are to be performed on the minus No. 40 sieve size particles, approximately ¼ in. For field classification purposes, screening is not intended, simply remove by hand the coarse particles that interfere with the tests.

Dilatancy (Reaction to shaking)

After removing particles larger than No. 40 sieve size, prepare a pat of moist soil with a volume of about one half cubic inch. Add enough water if necessary to make the soil soft but not sticky.

Place the pat in the open palm of one hand and shake horizontally, striking vigorously against the other hand several times. A positive reaction consists of the appearance of water on the surface of the pat which changes to a livery consistency and becomes glossy. When the sample is squeezed between the fingers, the water and gloss disappear from the surface, the pat stiffens and finally it cracks or crumbles. The rapidity of appearance of water during shaking and of its disappearance during squeezing help in identifying the character of the fines in a soil. Very fine clean sands give the quickest and most distinct reaction, whereas a plastic clay has no reaction. Inorganic silts, such as a typical rock flour, show a moderately quick reaction.

Dry Strength (Crushing characteristics)

After removing particles larger than No. 40 sieve size, mould a pat of soil to the consistency of putty, adding water if necessary. Allow the pat to dry completely by oven, sun or air drying, and then test its strength by breaking and crumbling between the fingers. This strength is a measure of the character and quantity of the colloidal fraction contained in the soil. The dry strength increases with increasing plasticity.

High dry strength is characteristic for clays of the CH group. A typical inorganic silt possesses only very slight dry strength. Silty fine sands and silts have about the same slight dry strength, but can be distinguished by the feel when powdering the dried specimen between the fingers. Fine sand feels gritty whereas a typical silt has the smooth feel of flour.

Toughness (Consistency near plastic limit)

After removing particles larger than No. 40 sieve size, a specimen of soil about one-half inch cube in size, is moulded to the consistency of putty. If too dry, water must be added and if sticky, the specimen should be spread out in a thin layer and allowed to lose some moisture by evaporation. Then the specimen is rolled out by hand on a smooth surface or between the palms into a thread about one-eighth inch in diameter. The thread is then folded and re-rolled repeatedly. During this manipulation the moisture content is gradually reduced and the specimen stiffens, finally loses its plasticity, and crumbles when the plastic limit is reached.

After the thread crumbles, the pieces should be lumped together and a slight kneading action continued until the lump crumbles.

The toughness of the thread near the plastic limit and the stiffness of the lump when it finally crumbles, the more pronounced these characteristics are for a given soil. Weakness of the thread at the plastic limit and quick loss of coherence of the lump below the plastic limit indicate either inorganic clay of low plasticity, or materials such as kaolin-type clays and organic clays which occur below the A-line.

Highly organic clays have a very weak and spongy feel at the plastic limit.

UNIFIED SOIL CLASSIFICATION SYSTEM

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

TABLE 6-1

FUGRO NATIONAL, INC.

Consistency: Consistency descriptions of coarse-grained soils (GW, GP, GM, GC, SW, SP, SM, SC) are as follows.

Consistency	N Value (ASTM D 1586-67)
Very Loose	0 - 4
Loose	4 - 10
Medium Dense	10 - 30
Dense	30 - 50
Very Dense	>50

Consistency descriptions of fine-grained soils (ML, CL, MH, CH,) are as follows:

Consistency	Shear Strength (ksf)	Shear Strength (kn/m^2)	Field Guide
Very Soft	0.25	12	Sample with height equal to twice the diameter, sags under own weight
Soft	0.25-0.50	12 - 24	Can be squeezed between thumb and forefinger
Firm	0.50-1.00	24-48	Can be molded easily with fingers
Stiff	1.00-2.00	48-96	Can be imprinted with slight pressure from fingers
Very Stiff	2.00-4.00	96-192	Can be imprinted with considerable pressure from fingers
Hard	over 4.00	over 192	Cannot be imprinted by fingers

Grain Shape: Angular - particles have sharp edges and relatively plane sides with unpolished surfaces.

Subangular - particles are similar to angular but have somewhat rounded edges.

Subrounded - particles exhibit nearly plane sides but have well-rounded corners and edges.

Rounded - particles have smoothly curved sides and no edges.

Calcareous : Containing calcium carbonate; presence of calcium carbonate is commonly identified on the basis of reaction with dilute hydrochloric acid.

Caliche : Soils cemented by porous calcium carbonate and/or other soluble minerals by upward-moving solutions.

Degree of Cementation: (Stages of development of caliche profile)

Stage	Gravelly Soils	Nongravelly Soils
I	Thin, discontinuous pebble coatings	Few filaments or faint coatings
II	Continuous pebble coatings, some interpebble fillings	Few to abundant nodules, flakes, filaments
III	Many interpebble fillings	Many nodules and internodular fillings
IV	Laminar horizon overlying plugged horizon	Increasing carbonate impregnation

Secondary Material : Example - Sand with trace to some silt

Trace - 5-12% (by dry weight)
Little - 13-20% (by dry weight)
Some - >21% (by dry weight)

Plasticity : Plasticity index is the range of water content, expressed as a percentage of the weight of the oven-dried soil, through which the soil is plastic. It is defined as the liquid limit minus the plastic limit. Descriptive ranges used on the logs include:

Nonplastic	(PI, 0 - 4)
Slightly Plastic	(PI, 4 - 15)
Medium Plastic	(PI, 15 - 30)
Highly Plastic	(PI, >31)

Cobbles and Boulders : A cobble is a rock fragment, usually rounded by weathering or abrasion, with an average diameter ranging between 3 and 12 inches (8 and 30 cm).

A boulder is a rock fragment, usually rounded by weathering or abrasion, with an average diameter of 12 inches (30 cm) or more.

I. Remarks - This column was provided on boring and trench logs for comments regarding drilling difficulty, number and size of cobbles or boulders encountered, trench wall stability, loss of drilling fluid in the boring, and other conditions encountered during drilling and excavations.

J. Dry Density and Moisture Content - The boring logs include a graphical display of laboratory test results for dry density (ASTM D 2937-71) in pounds per cubic foot and kilograms per cubic meter and moisture content (ASTM D 2216-71) in percent from representative samples taken during drilling. The symbols are explained at the bottom of the boring logs.

K. Seive Analysis - The numbers represent the percentage by dry weight (ASTM D 422-63) of each of the following soil components:

GR - Gravel, rock particles that will pass a 3-inch (76 mm) sieve and are retained on No. 4 (4.75 mm) sieve.

SA - Sand, soil particles passing No. 4 sieve and retained on No. 200 (0.075 mm) sieve.

FI - Fines, silt or clay, soil particles passing No. 200 sieve.

L. Atterberg Limits (LL and PI) -

LL - Liquid Limit, the water content corresponding to the arbitrary limit between the liquid and plastic states of consistency of a soil (ASTM D 423-66).

PL - Plastic Limit, the water content corresponding to an arbitrary limit between the plastic and the semisolid state of consistency of a soil (ASTM D 424-59).

PI - Plasticity Index, numerical difference between the liquid limit (LL) and the plastic limit (PL) indicating the range of moisture content within which a soil-water mixture is plastic.

NP - Nonplastic.

M. Miscellaneous Information -

Elevations - indicated elevations on the logs are estimated from topographic maps of the study area, within an accuracy of half the contour interval.

Surficial Geologic Unit - indicates the surficial geologic unit in which the activity is located.

Date Drilled - indicates the period from beginning to completion of the activity.

Drilling Method - signifies the type of drilling procedure used such as rotary wash.

Hole Diameter - nominal size of boring drilled.

Water Level - indicates depth from ground surface to water table where encountered.

Trench Length - length at ground surface of final trench excavation.

Trench Orientation - bearing of longitudinal trench centerline.

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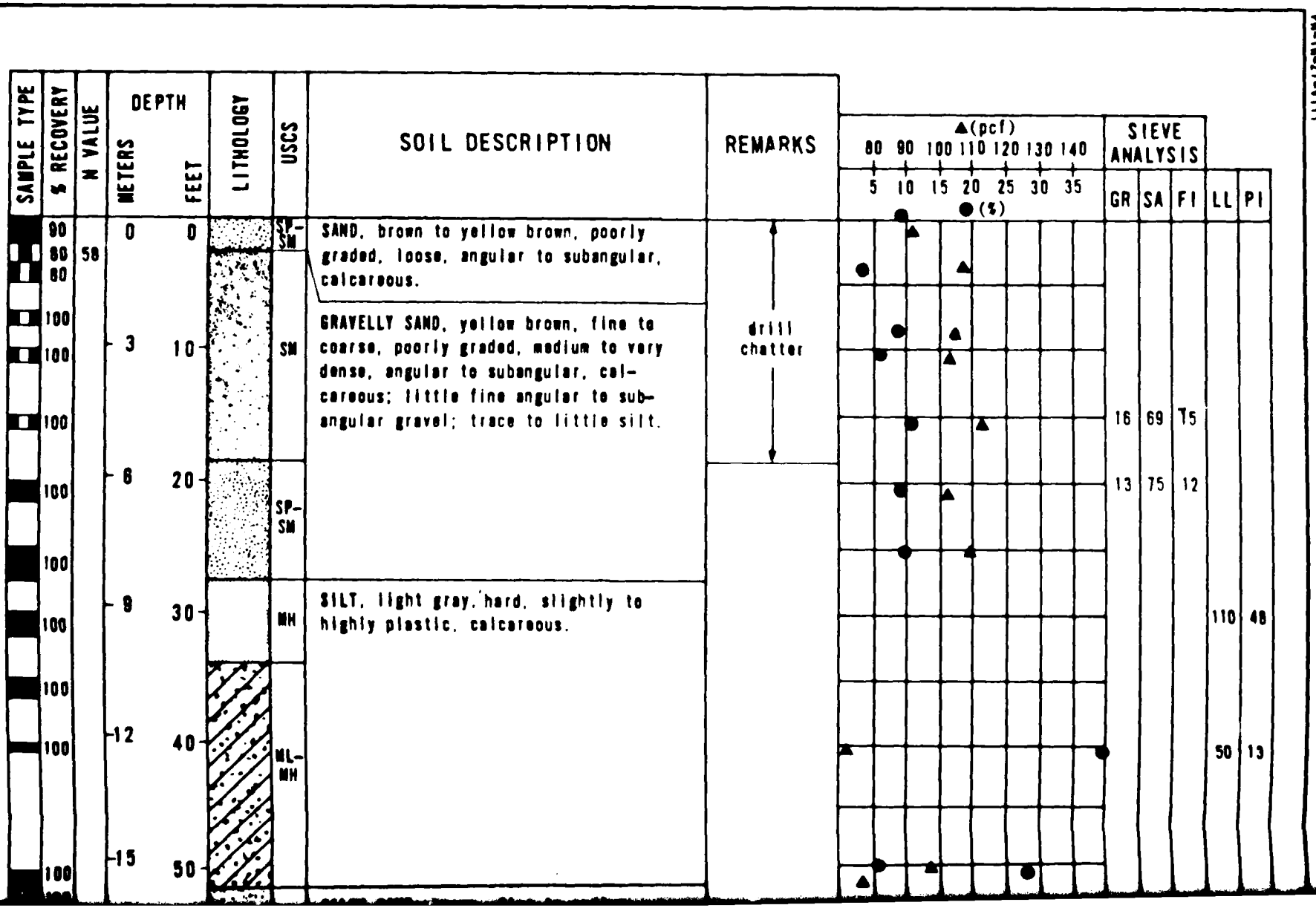

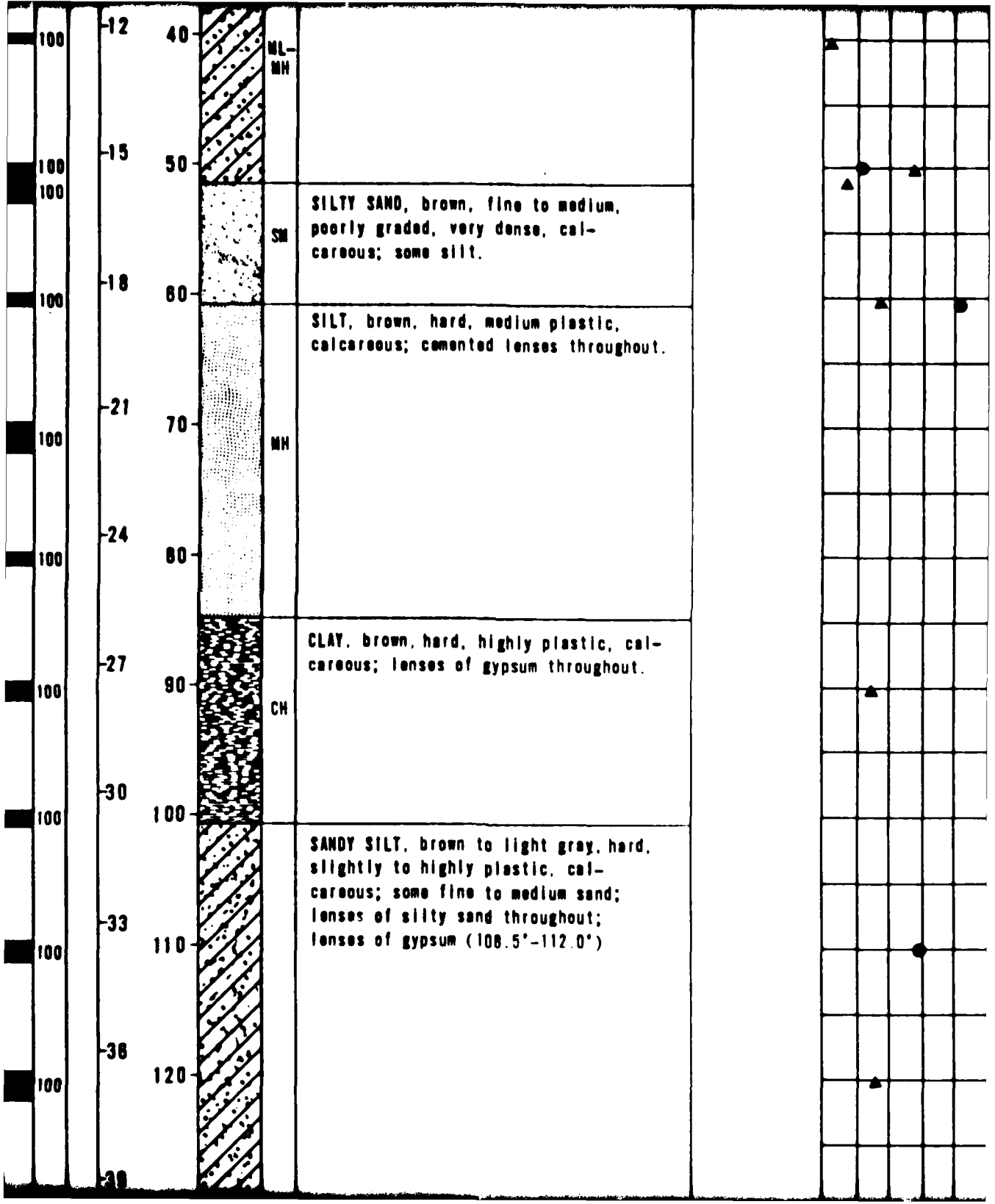
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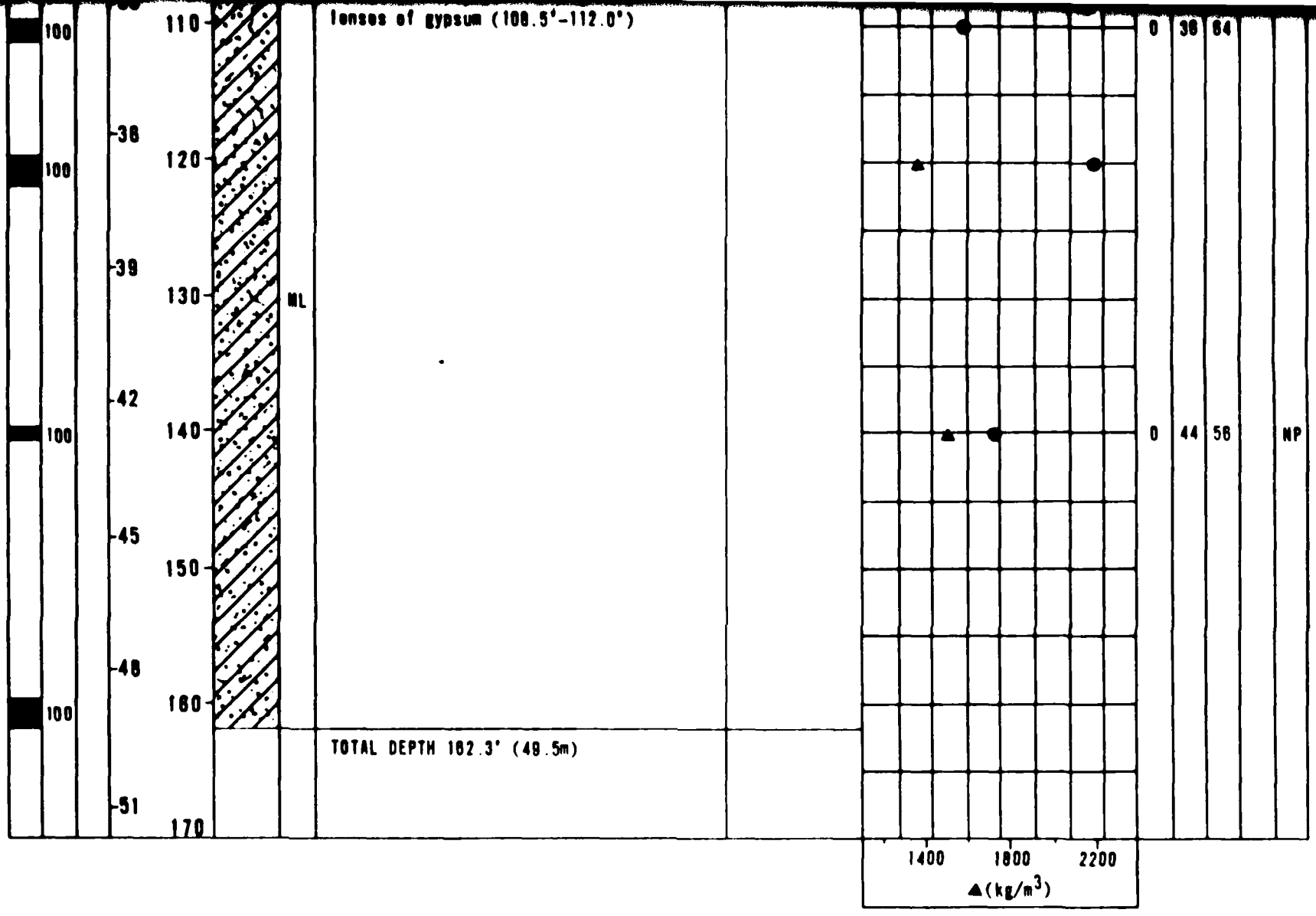
70
80
90
100
110
120
ML-MH
SM
MH
CH
SILTY SAND, brown, fine to medium, poorly graded, very dense, calcareous; some silt.
SILT, brown, hard, medium plastic, calcareous; cemented lenses throughout.
CLAY, brown, hard, highly plastic, calcareous; lenses of gypsum throughout.
SANDY SILT, brown to light gray, hard, slightly to highly plastic, calcareous; some fine to medium sand; lenses of silty sand throughout; lenses of gypsum (108.5'-112.0')



EXPLANATION

- FUGRO DRIVE SAMPLE
- BULK SAMPLE
- PITCHER TUBE SAMPLE
- STANDARD PENETRATION TEST SAMPLE
- CORE SAMPLE

BORING DETAILS

ELEVATION	: 5145' (1568m)
SURFICIAL GEOLOGIC UNIT	: A5y
DATE DRILLED	: 4-5 April 1979
DRILLING METHOD	: Rotary Wash
HOLE DIAMETER	: 4 7 8" (124mm)
WATER LEVEL	: Not Encountered

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LOG OF
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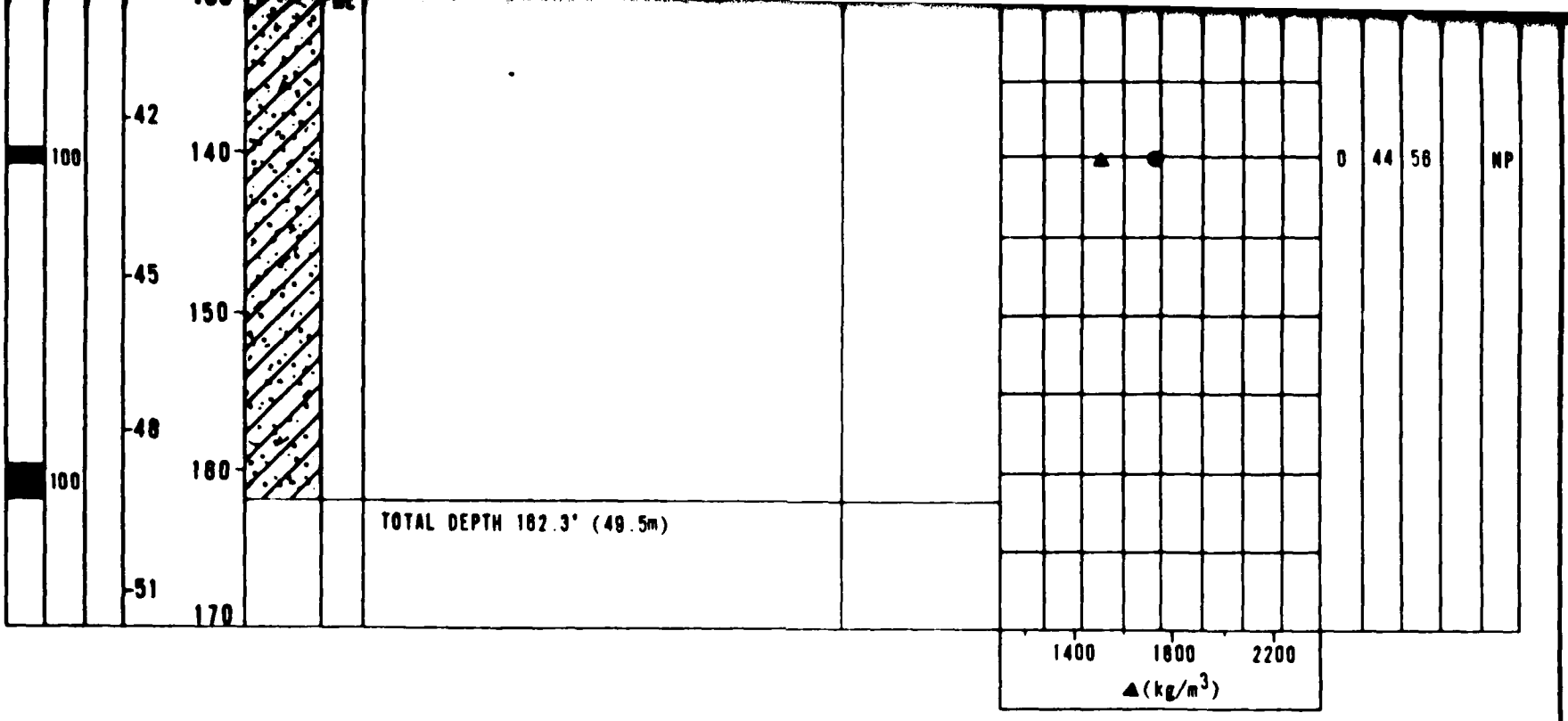

EXPLANATION

- FUGRO DRIVE SAMPLE
- BULK SAMPLE
- PITCHER TUBE SAMPLE
- STANDARD PENETRATION TEST SAMPLE
- CORE SAMPLE
- N - STANDARD PENETRATION RESISTANCE
- ▲ - DRY UNIT WEIGHT (ASTM: D-2937-71)
- ● - MOISTURE CONTENT (ASTM: D-2216-71)
- NR - NO RECOVERY

BORING DETAILS

ELEVATION	: 5145' (1568m)
SURFICIAL GEOLOGIC UNIT	: A5y
DATE DRILLED	: 4-5 April 1979
DRILLING METHOD	: Rotary Wash
HOLE DIAMETER	: 4 7 8" (124mm)
WATER LEVEL	: Not Encountered

FUGRO NATIONAL, INC.

LOG OF BORING BS-B-1
VERIFICATION SITE, BIG SMOKY COR, NEVADA
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE SAMSO
FIGURE 6-1

AFV-8E

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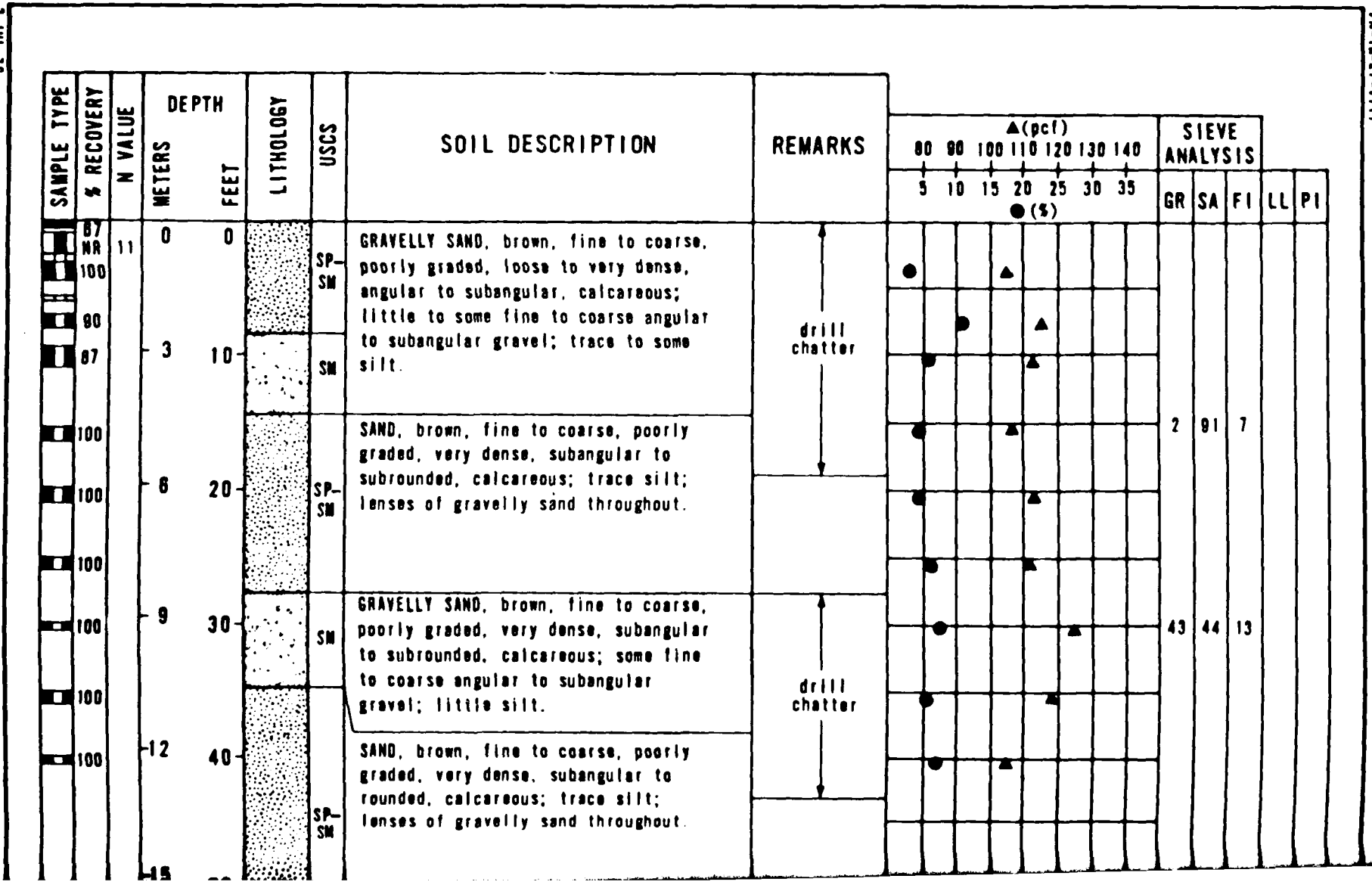

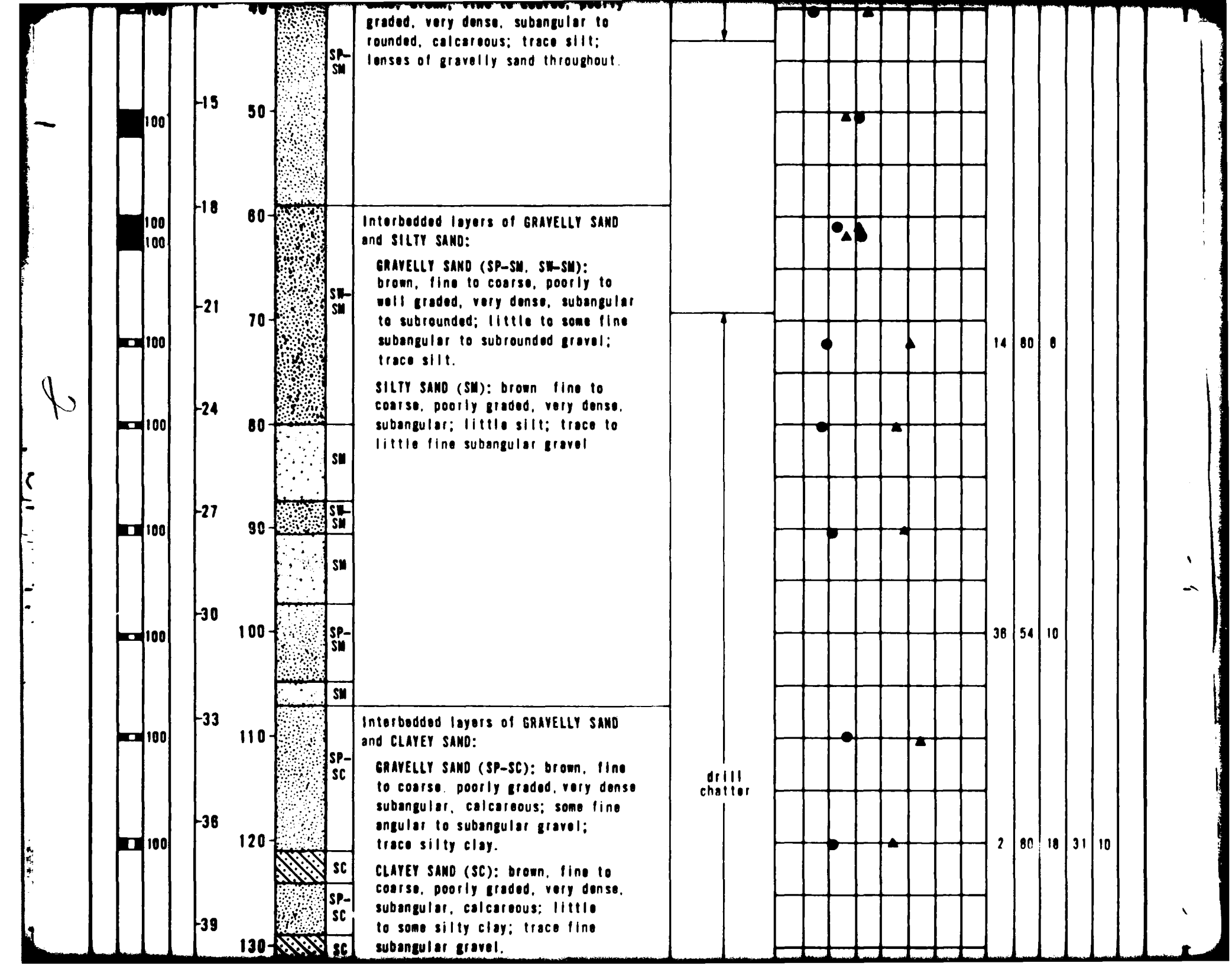
graded, very dense, subangular to rounded, calcareous; trace silt; lenses of gravelly sand throughout.
SP-SM
Interbedded layers of GRAVELLY SAND and SILTY SAND:
GRAVELLY SAND (SP-SM, SW-SM): brown, fine to coarse, poorly to well graded, very dense, subangular to subrounded; little to some fine subangular to subrounded gravel; trace silt.
SILTY SAND (SM): brown fine to coarse, poorly graded, very dense, subangular; little silt; trace to little fine subangular gravel
SW-SM
SM
SW-SM
SM
SP-SM
SM
Interbedded layers of GRAVELLY SAND and CLAYEY SAND:
GRAVELLY SAND (SP-SC): brown, fine to coarse, poorly graded, very dense subangular, calcareous; some fine angular to subangular gravel; trace silty clay.
CLAYEY SAND (SC): brown, fine to coarse, poorly graded, very dense, subangular, calcareous; little to some silty clay; trace fine subangular gravel.
SP-SC
SC
SP-SC
SC
drill chatter
100
100
100
100
100
100
100
15
18
21
24
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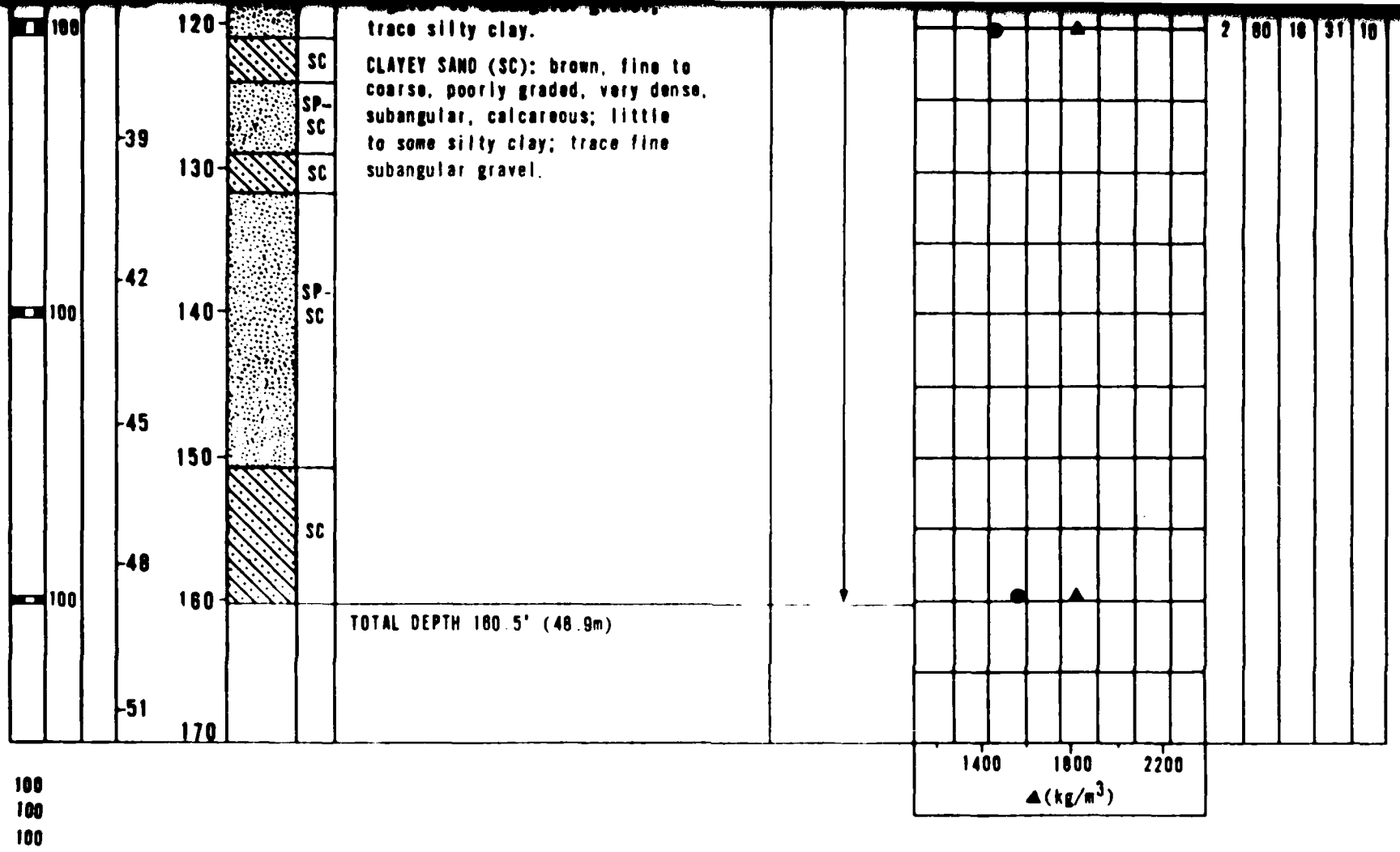
120
130
14 80 6
36 54 10
2 80 18 31 10



EXPLANATION

- FUGRO DRIVE SAMPLE
- BULK SAMPLE
- PITCHER TUBE SAMPLE
- STANDARD PENETRATION TEST SAMPLE
- CORE SAMPLE
- N - STANDARD PENETRATION RESISTANCE
- ▲ - DRY UNIT WEIGHT (ASTM: D-2937-71)
- ● - MOISTURE CONTENT (ASTM: D-2216-71)
- NR - NO RECOVERY

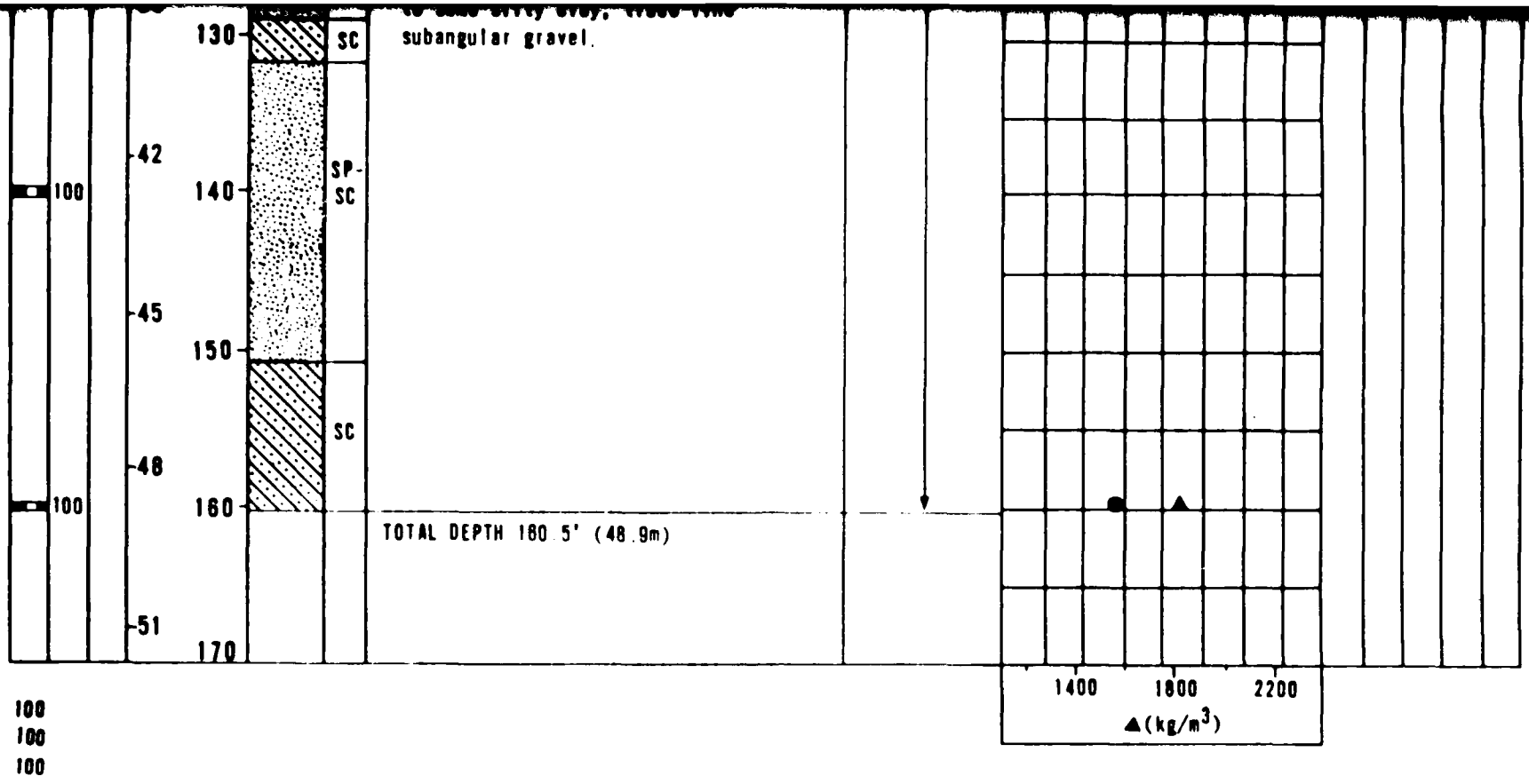
BORING DETAILS

ELEVATION	: 5018' (1529m)
SURFICIAL GEOLOGIC UNIT	: A5y/A3
DATE DRILLED	: 6-7 April 1979
DRILLING METHOD	: Rotary Wash
HOLE DIAMETER	: 4 7 8" (124mm)
WATER LEVEL	: Not Encountered

FUGRO NATIONAL

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

LOG OF BORING BS-B-2
VERIFICATION SITE, BIG SMOKY COR.



EXPLANATION

- FUGRO DRIVE SAMPLE
- BULK SAMPLE
- PITCHER TUBE SAMPLE
- STANDARD PENETRATION TEST SAMPLE
- CORE SAMPLE
- N - STANDARD PENETRATION RESISTANCE
- ▲ - DRY UNIT WEIGHT (ASTM: D-2937-71)
- ● - MOISTURE CONTENT (ASTM: D-2216-71)
- NR - NO RECOVERY

BORING DETAILS

ELEVATION	:	5018' (1529m)
SURFICIAL GEOLOGIC UNIT	:	A5y/A3
DATE DRILLED	:	6-7 April 1979
DRILLING METHOD	:	Rotary Wash
HOLE DIAMETER	:	4 7 8" (124mm)
WATER LEVEL	:	Not Encountered

FUGRO NATIONAL, INC.

LOG OF BORING BS-8-2
VERIFICATION SITE, BIG SMOKY COR., NEVADA
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO
FIGURE 6-2

AFN-06

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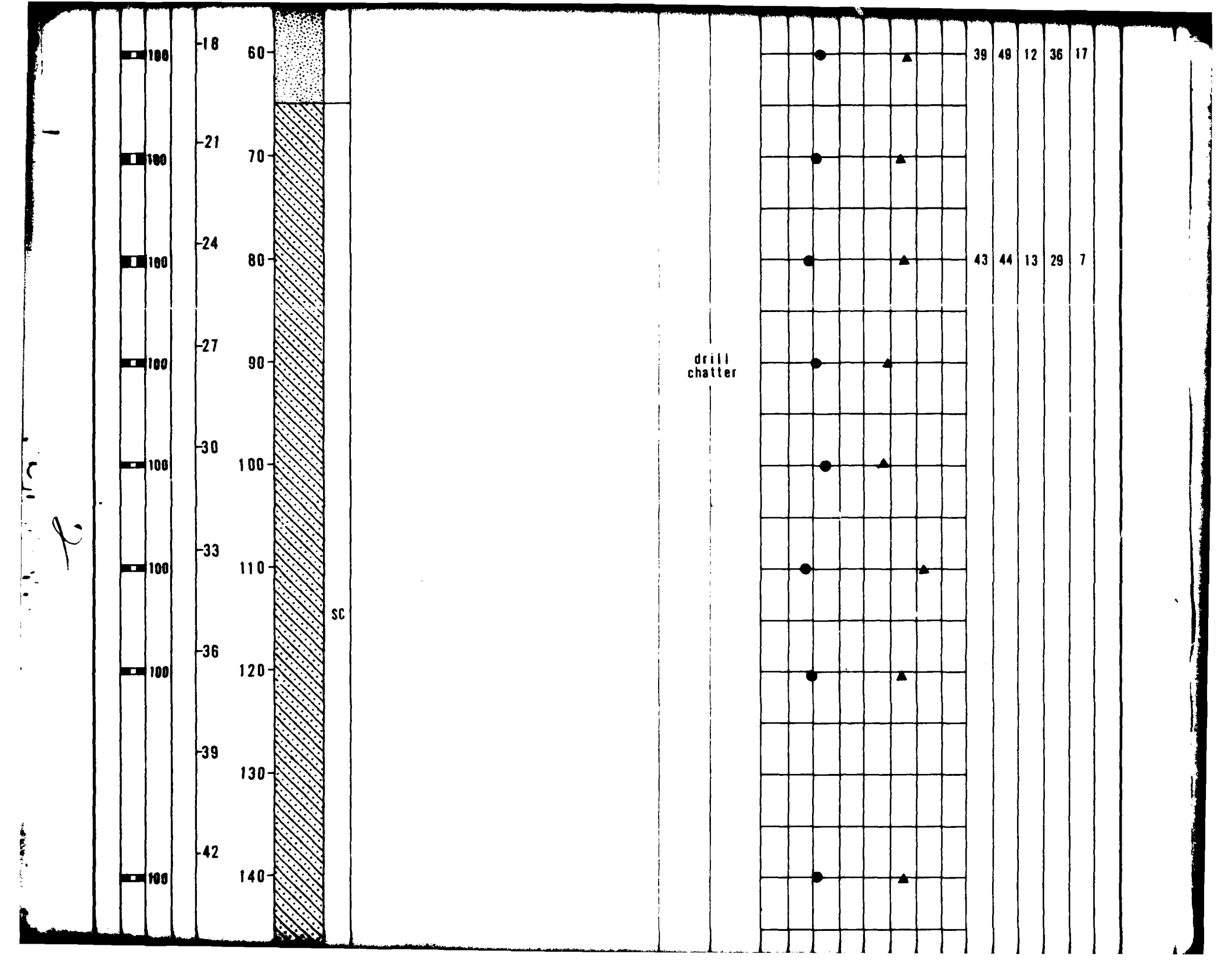
FN-TR-27-4111

SAMPLE TYPE	% RECOVERY	N VALUE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	SOIL DESCRIPTION	REMARKS	▲(pcf) 80 90 100 110 120 130 140 / ● (%) 5 10 15 20 25 30 35	SIEVE ANALYSIS GR	SA	FI	LL	PI
	95		0	0		SP-SM	GRAVELLY SAND, brown, fine to coarse, poorly graded, loose to dense, angular to subangular; little to some fine to coarse subangular gravel; trace to some silt.	drill chatter		19	74	7		
	67	12												
	100					SM								
	88									36	40	24		
	100		3	10		GW	SANDY GRAVEL, brown, fine to coarse, well graded, dense to very dense, angular to subangular; some fine to coarse angular to subangular sand.			59	38	3		
	100						GRAVELLY SAND, brown, fine to coarse, well graded, very dense, angular to subangular; little fine subangular gravel; trace silt.							
	100		6	20		SW-SM				18	73	9		
	100													
	100		9	30		SM	SILTY SAND, brown, fine to coarse, poorly graded, very dense, subangular; some silt.							
	100					SP-SM	GRAVELLY SAND, brown, fine to coarse, poorly graded, very dense, angular to subangular; some fine to coarse subangular gravel; trace to little silty clay (46.0'-161.0').							
	100		12	40						44	49	7		
	100		15	50		SP-SC								
	100		18	60						39	49	12	36	17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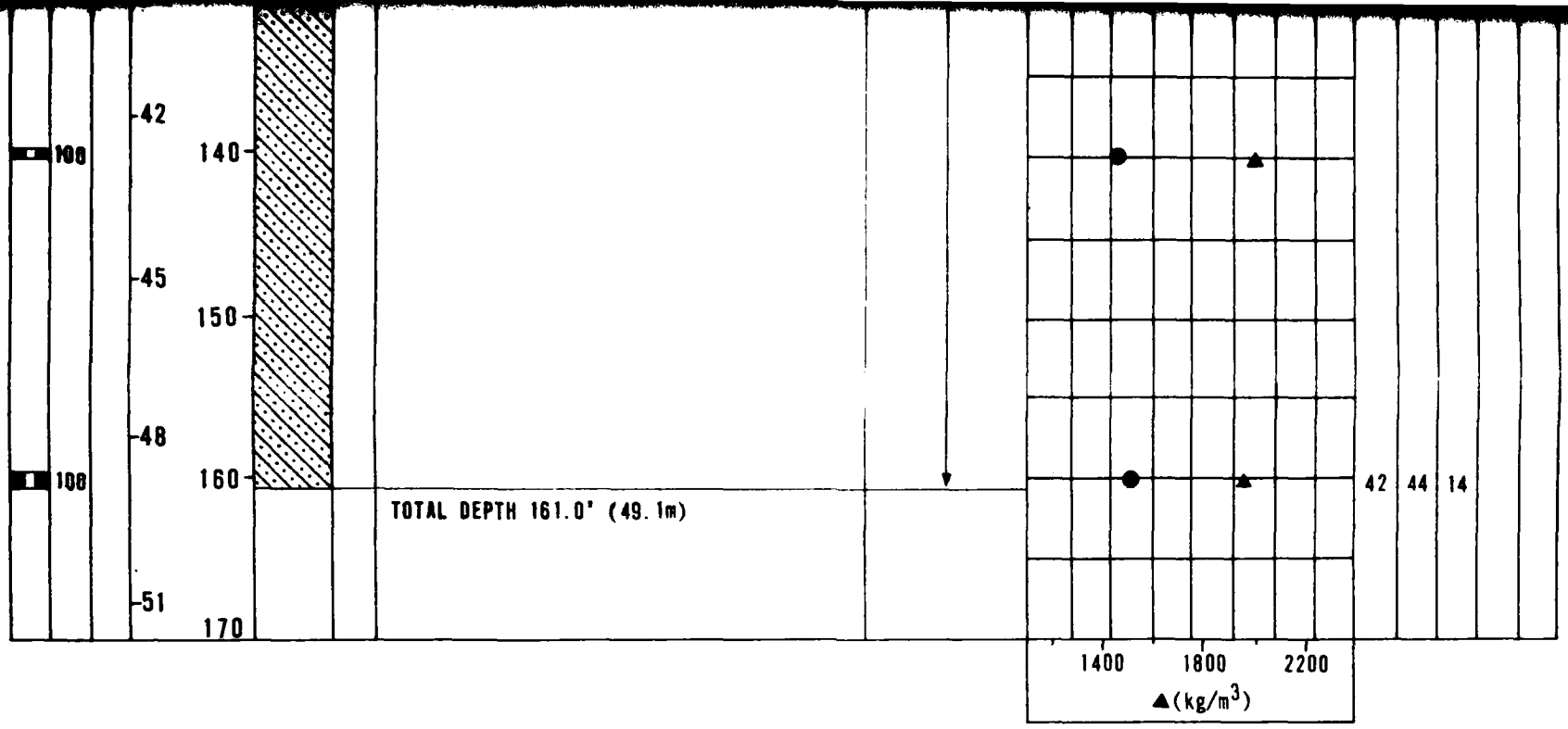
SC
drill
chatter
39 48 12 36 17
43 44 13 29 7



EXPLANATION

- FUGRO DRIVE SAMPLE
- BULK SAMPLE
- PITCHER TUBE SAMPLE
- STANDARD PENETRATION TEST SAMPLE
- CORE SAMPLE
- N - STANDARD PENETRATION RESISTANCE
- ▲ - DRY UNIT WEIGHT (ASTM: D-2937-71)
- ● - MOISTURE CONTENT (ASTM: D-2216-71)
- NR - NO RECOVERY

BORING DETAILS

ELEVATION	: 4980'± (1518m)
SURFICIAL GEOLOGIC UNIT	: A1/A5y
DATE DRILLED	: 7-8 April 1979
DRILLING METHOD	: Rotary Wash
HOLE DIAMETER	: 4 7/8" (124mm)
WATER LEVEL	: Not Encountered

FUGRO NATIONAL, INC.

LOG OF BORING BS-B-3

VERIFICATION SITE, BIG SMOKY COR, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE SAMSO

FIGURE B-3

AFY-06

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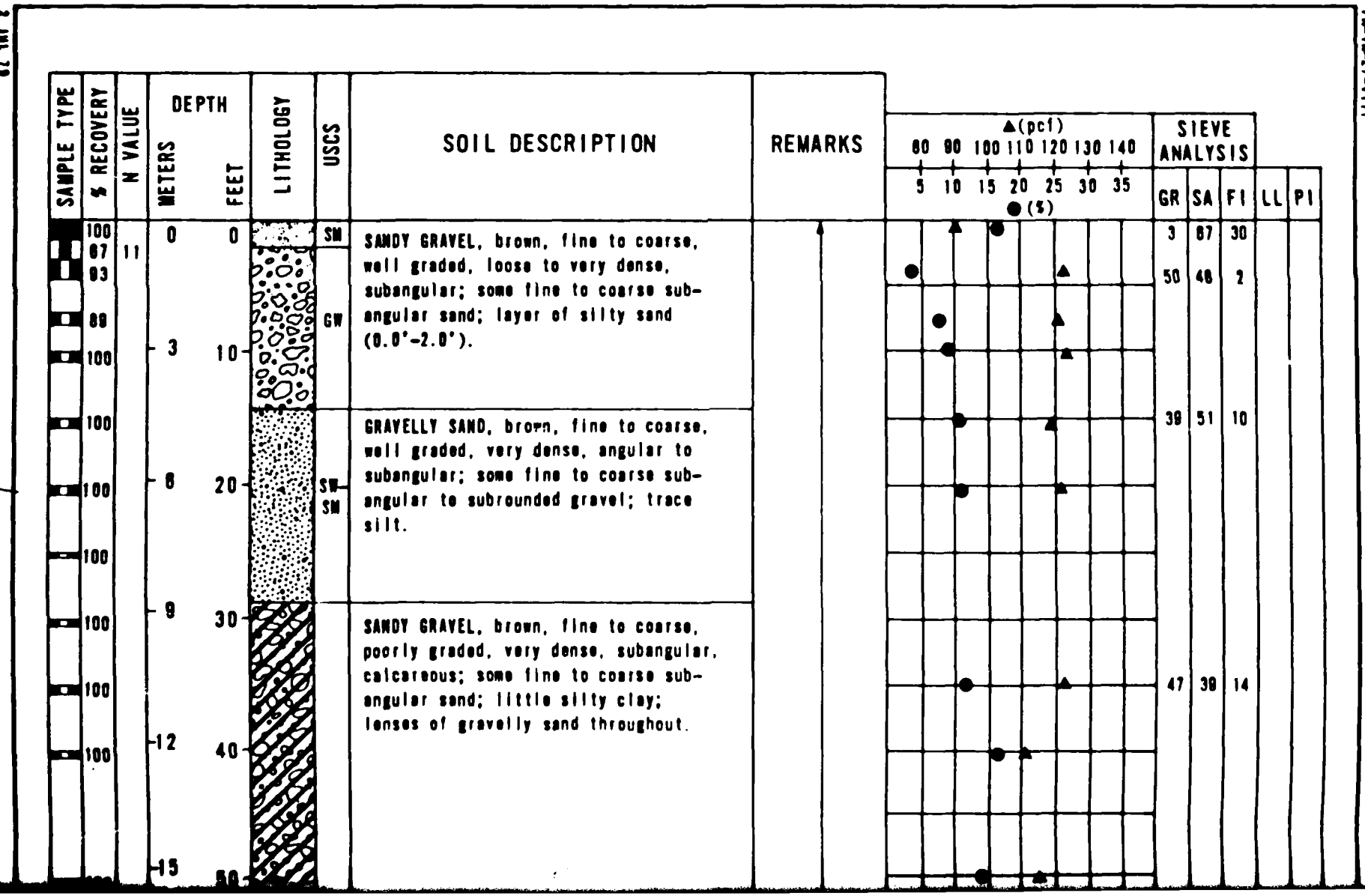

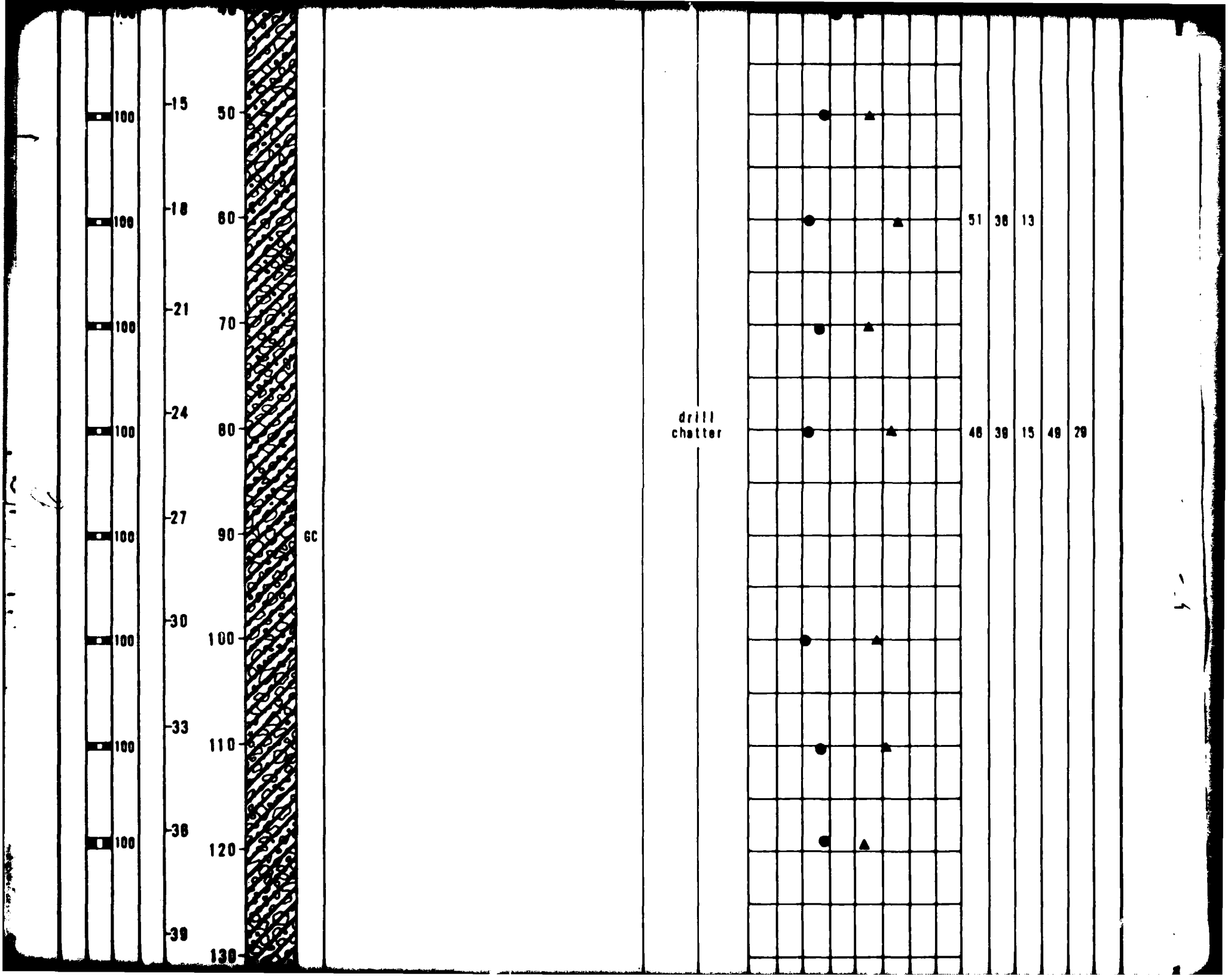
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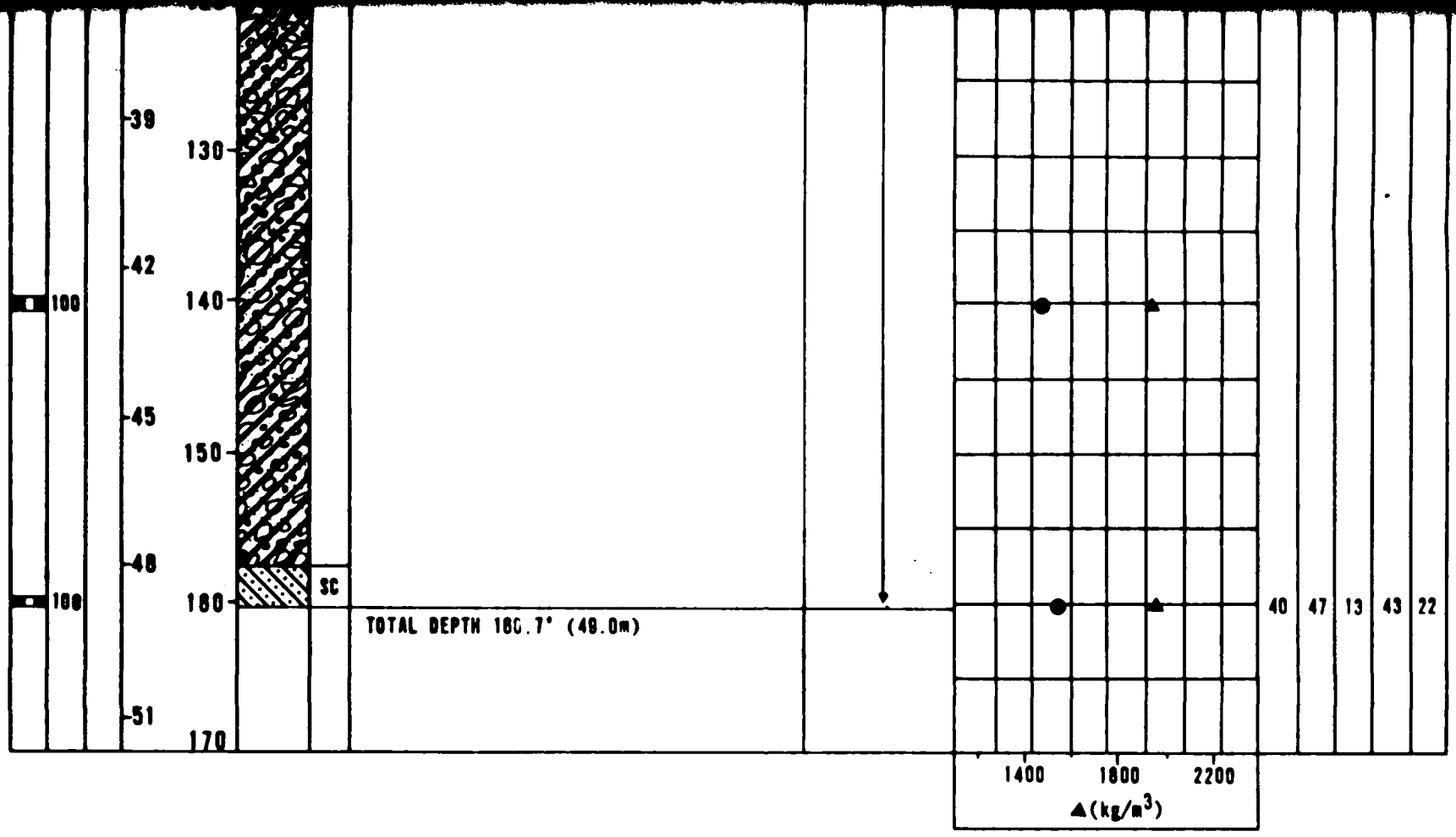
51 38 13
46 39 15 49 29



EXPLANATION

- FUGRO DRIVE SAMPLE
- BULK SAMPLE
- PITCHER TUBE SAMPLE
- STANDARD PENETRATION TEST SAMPLE
- CORE SAMPLE
- N - STANDARD PENETRATION RESISTANCE
- ▲ - DRY UNIT WEIGHT (ASTM: D-2937-71)
- ● - MOISTURE CONTENT (ASTM: D-2216-71)
- NR - NO RECOVERY

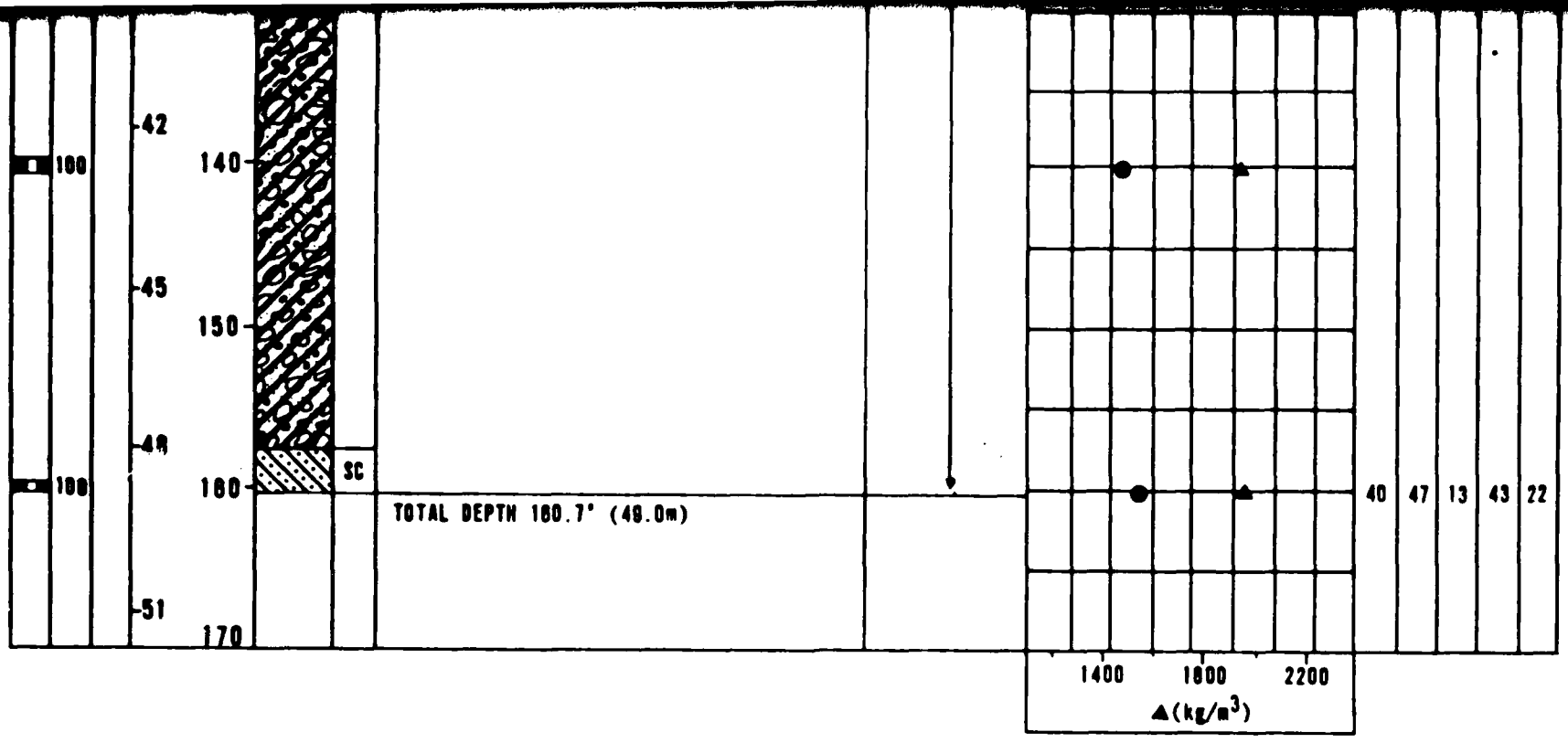
BORING DETAILS

ELEVATION	: 5108' (1557m)
SURFICIAL GEOLOGIC UNIT	: A1
DATE DRILLED	: 8-9 April 1978
DRILLING METHOD	: Rotary Wash
HOLE DIAMETER	: 4 7/8" (124mm)
WATER LEVEL	: Not Encountered

FUGRO NATIONAL

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

LOG OF BORING BS-8-4
VERIFICATION SITE, BIG SMOKY COR.



EXPLANATION

- FUGRO DRIVE SAMPLE
- BULK SAMPLE
- PITCHER TUBE SAMPLE
- STANDARD PENETRATION TEST SAMPLE
- CORE SAMPLE
- N - STANDARD PENETRATION RESISTANCE
- ▲ - DRY UNIT WEIGHT (ASTM: D-2937-71)
- ● - MOISTURE CONTENT (ASTM: D-2216-71)
- NR - NO RECOVERY

BORING DETAILS

ELEVATION	: 5108' (1557m)
SURFICIAL GEOLOGIC UNIT	: A1
DATE DRILLED	: 8-9 April 1979
DRILLING METHOD	: Rotary Wash
HOLE DIAMETER	: 4 7/8" (124mm)
WATER LEVEL	: Not Encountered

LOG OF BORING BS-8-4
VERIFICATION SITE, BIG SMOKY COR, NEVADA
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO
FIGURE 8-4
FUGRO NATIONAL, INC.
AFV-88

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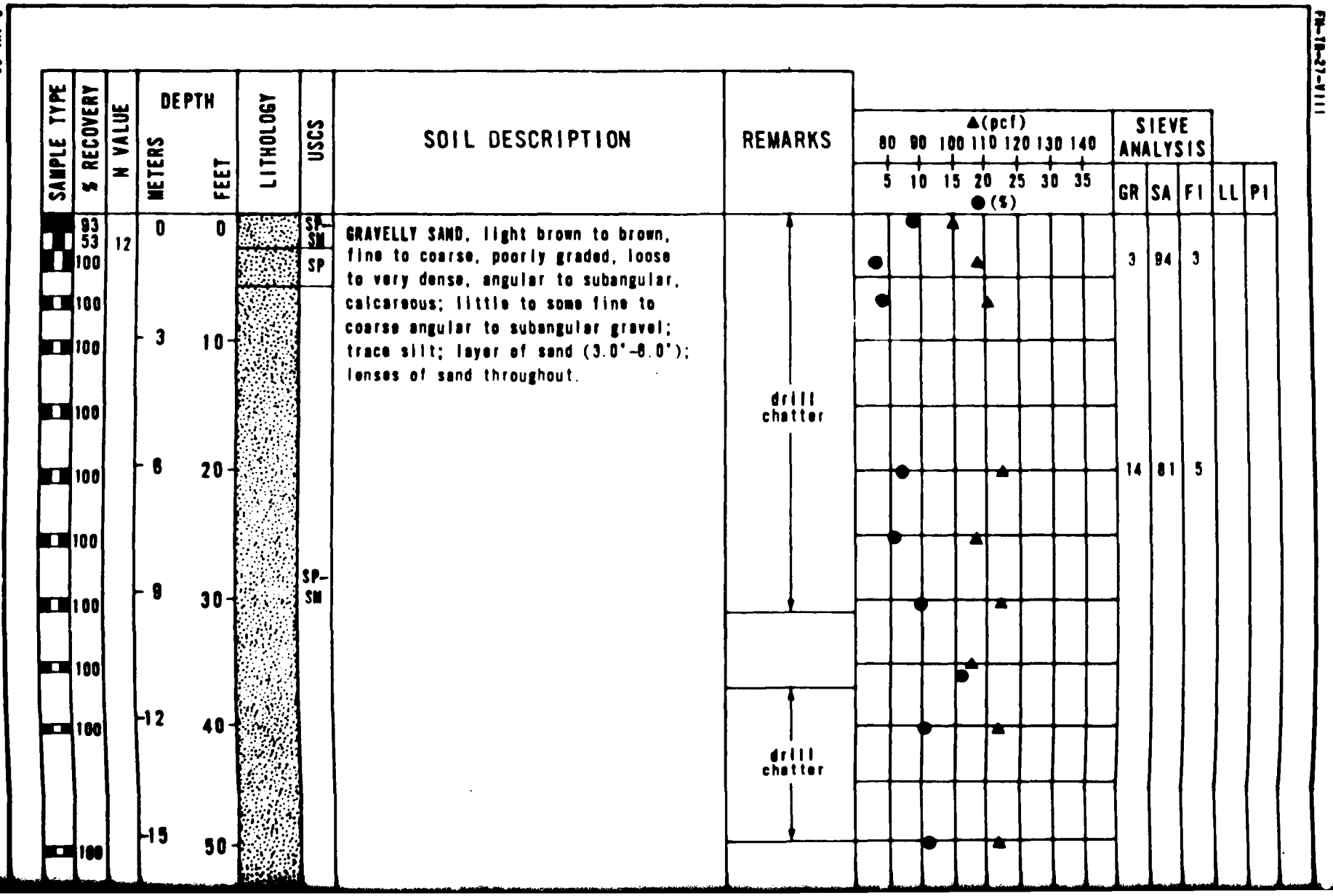

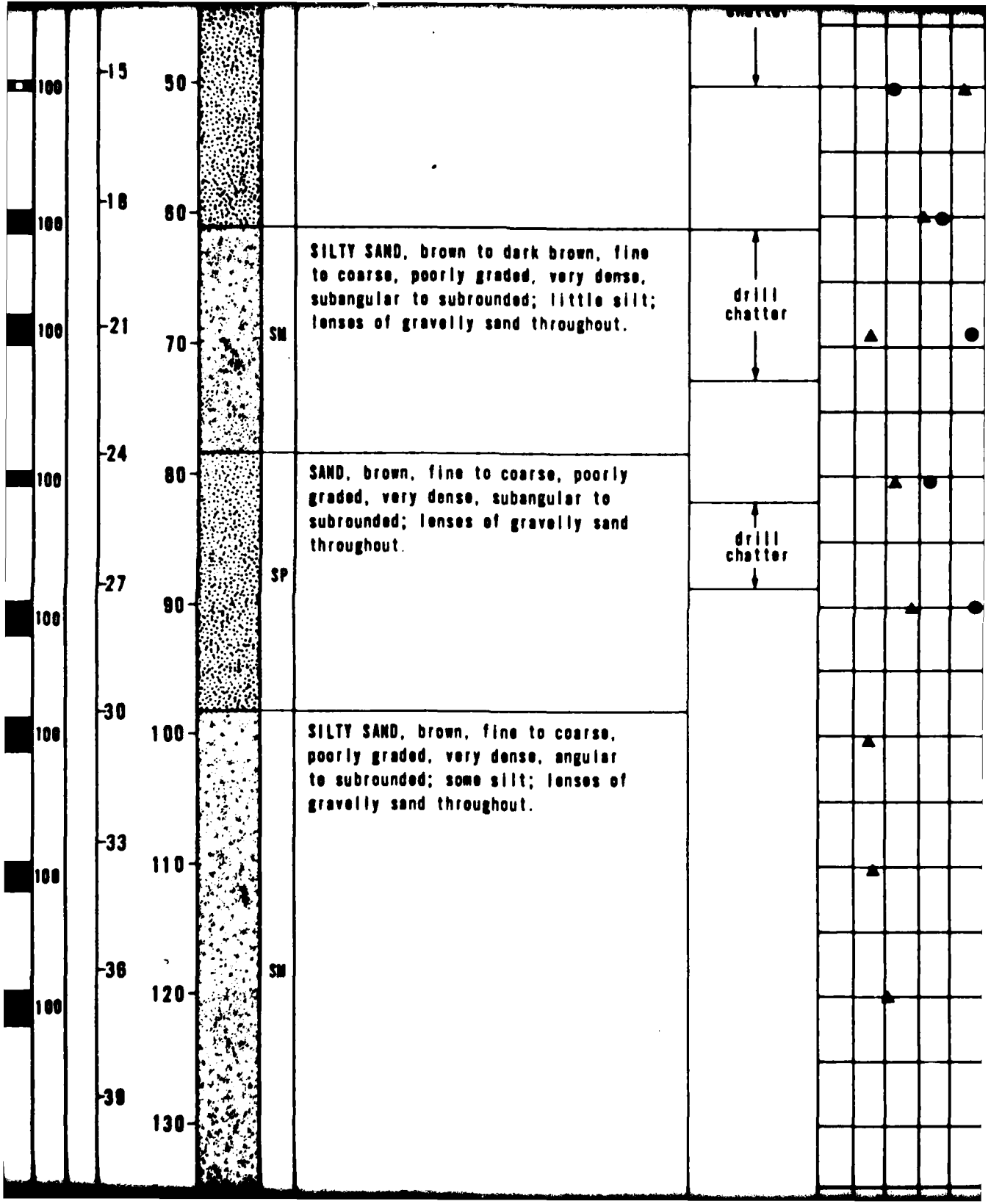
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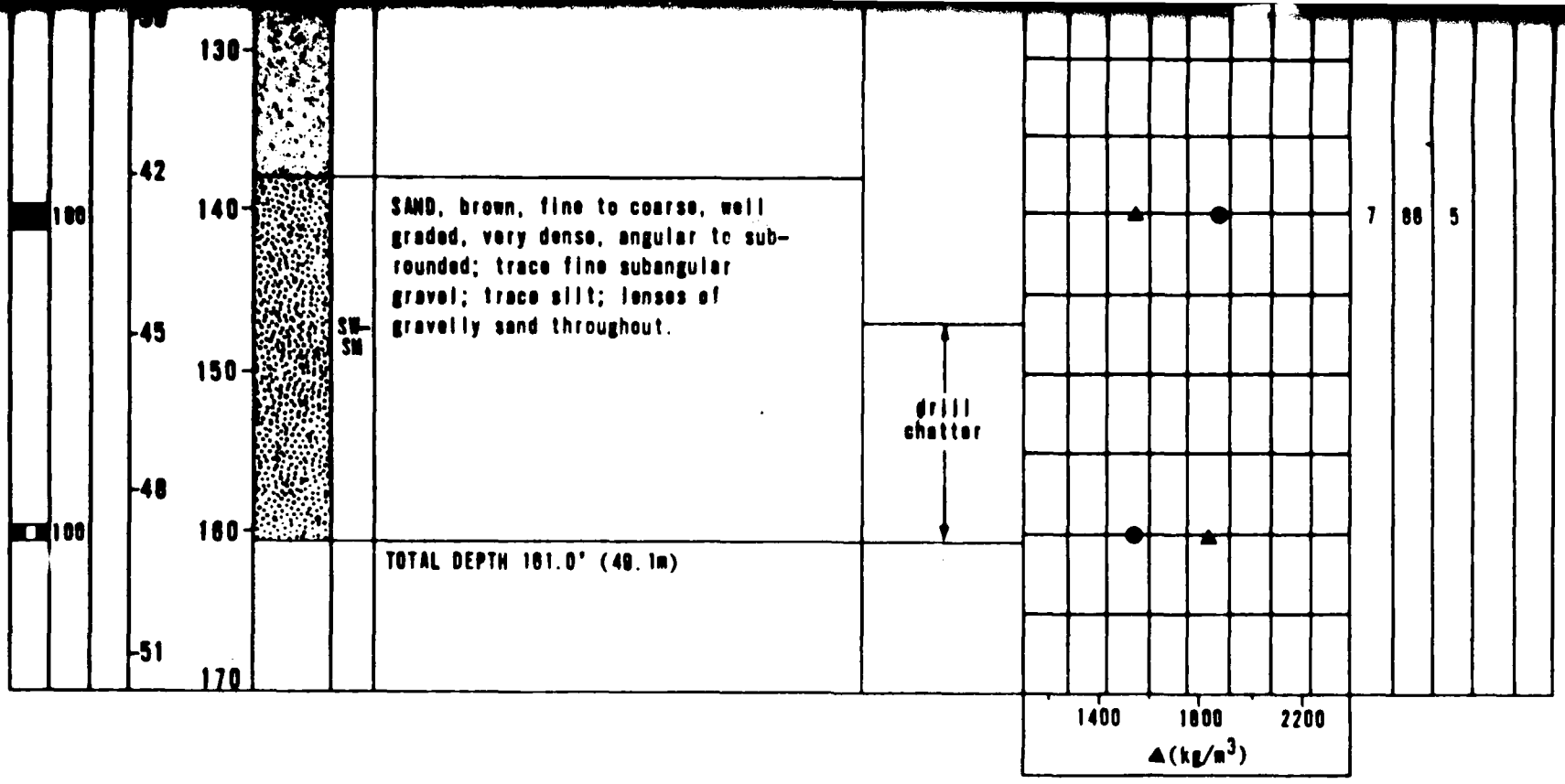
110
120
130
SM
SP
SM
SILTY SAND, brown to dark brown, fine to coarse, poorly graded, very dense, subangular to subrounded; little silt; lenses of gravelly sand throughout.
SAND, brown, fine to coarse, poorly graded, very dense, subangular to subrounded; lenses of gravelly sand throughout.
SILTY SAND, brown, fine to coarse, poorly graded, very dense, angular to subrounded; some silt; lenses of gravelly sand throughout.
drill chatter
drill chatter



EXPLANATION

- FUGRO DRIVE SAMPLE
- BULK SAMPLE
- PITCHER TUBE SAMPLE
- STANDARD PENETRATION TEST SAMPLE
- CORE SAMPLE
- N - STANDARD PENETRATION RESISTANCE
- ▲ - DRY UNIT WEIGHT (ASTM: D-2937-71)
- ● - MOISTURE CONTENT (ASTM: D-2216-71)
- NR - NO RECOVERY

BORING DETAILS

ELEVATION	: 5460' (1664m)
SURFICIAL GEOLOGIC UNIT	: A5y
DATE DRILLED	: 9 - 10 April 1979
DRILLING METHOD	: Rotary Wash
HOLE DIAMETER	: 4 7/8" (124mm)
WATER LEVEL	: Not Encountered

LOG OF BORING BS-8-5
VERIFICATION SITE, BIG SMOKY COR, NEVADA
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO
FIGURE 6-5
FUGRO NATIONAL, INC.
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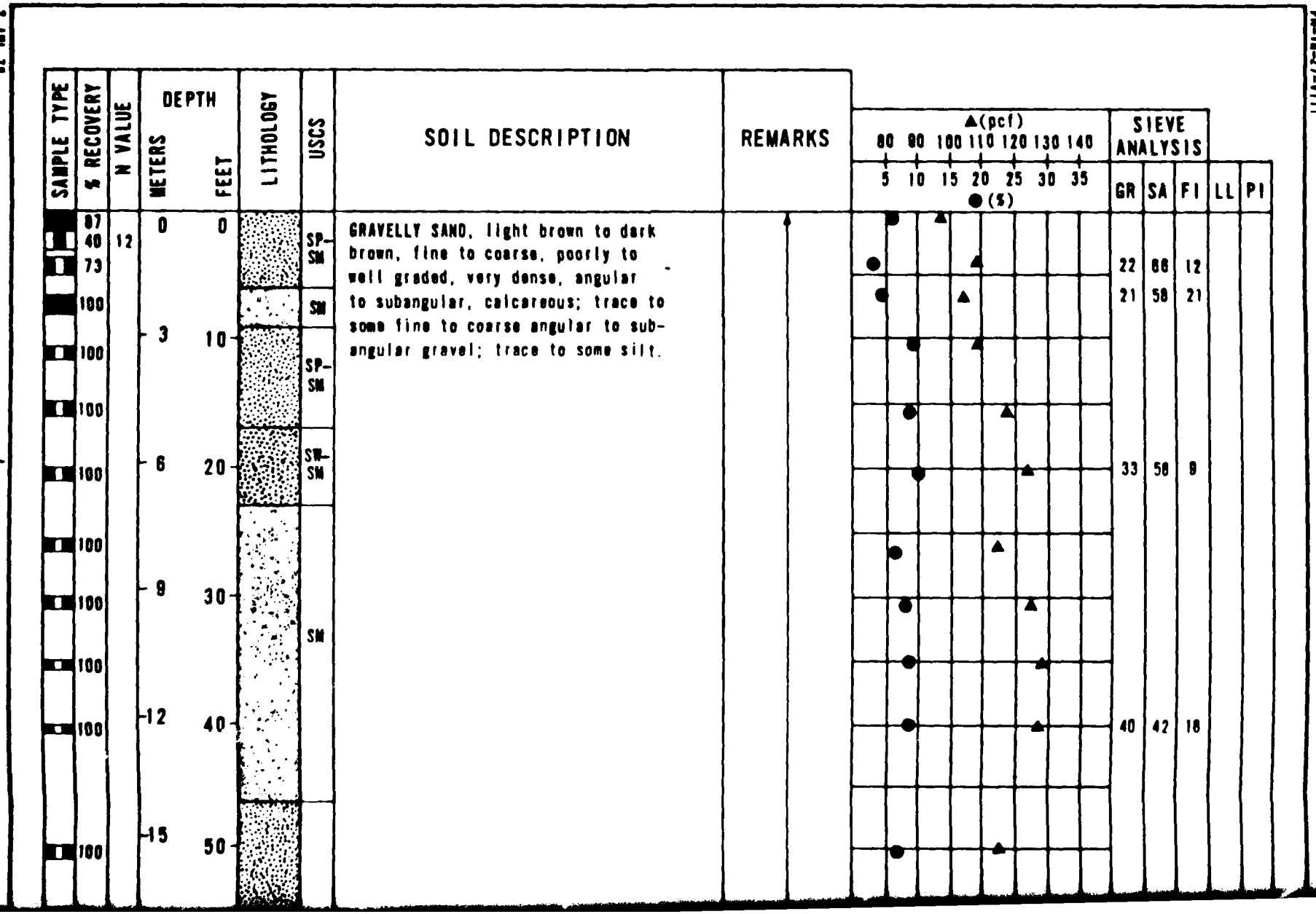
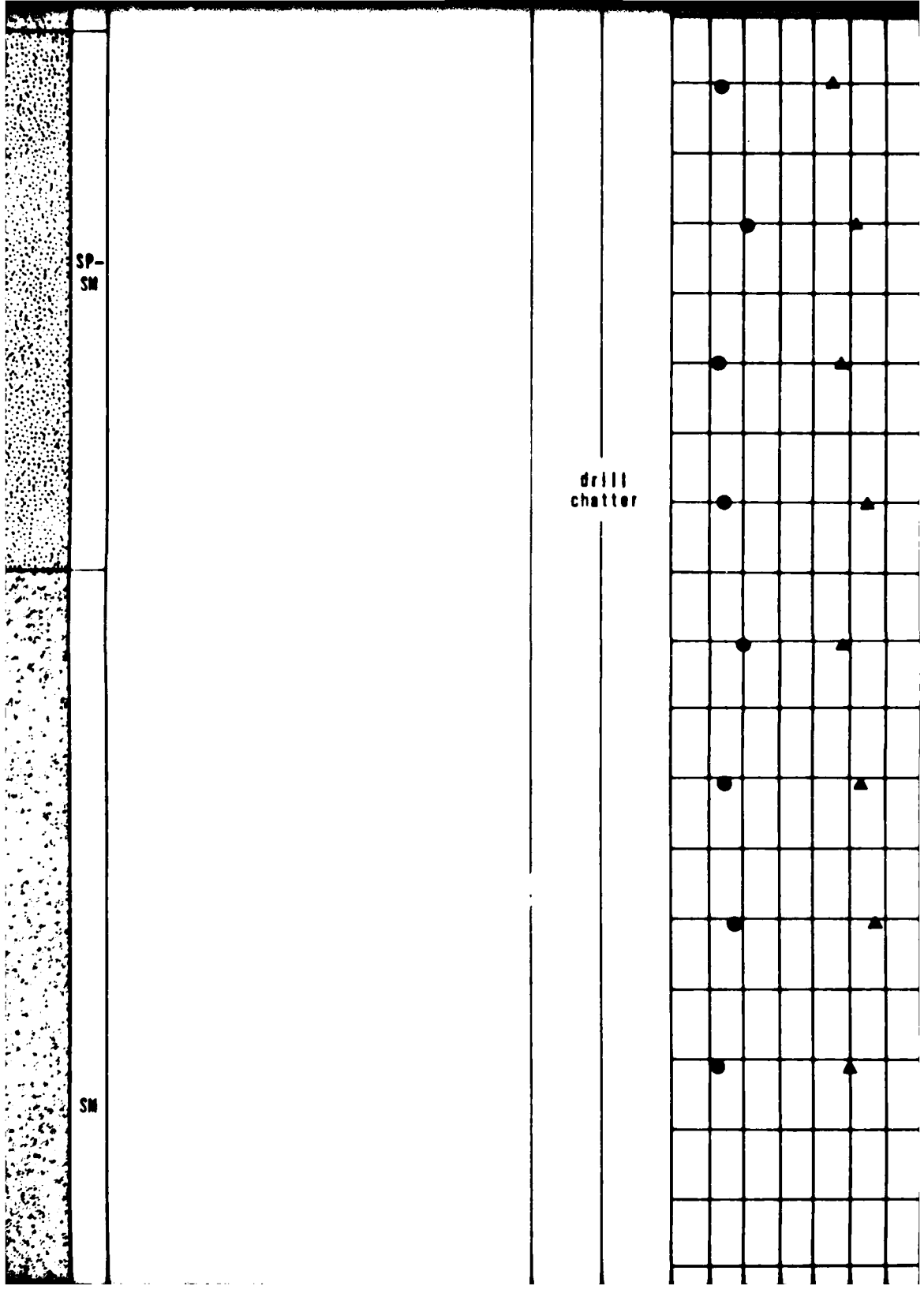
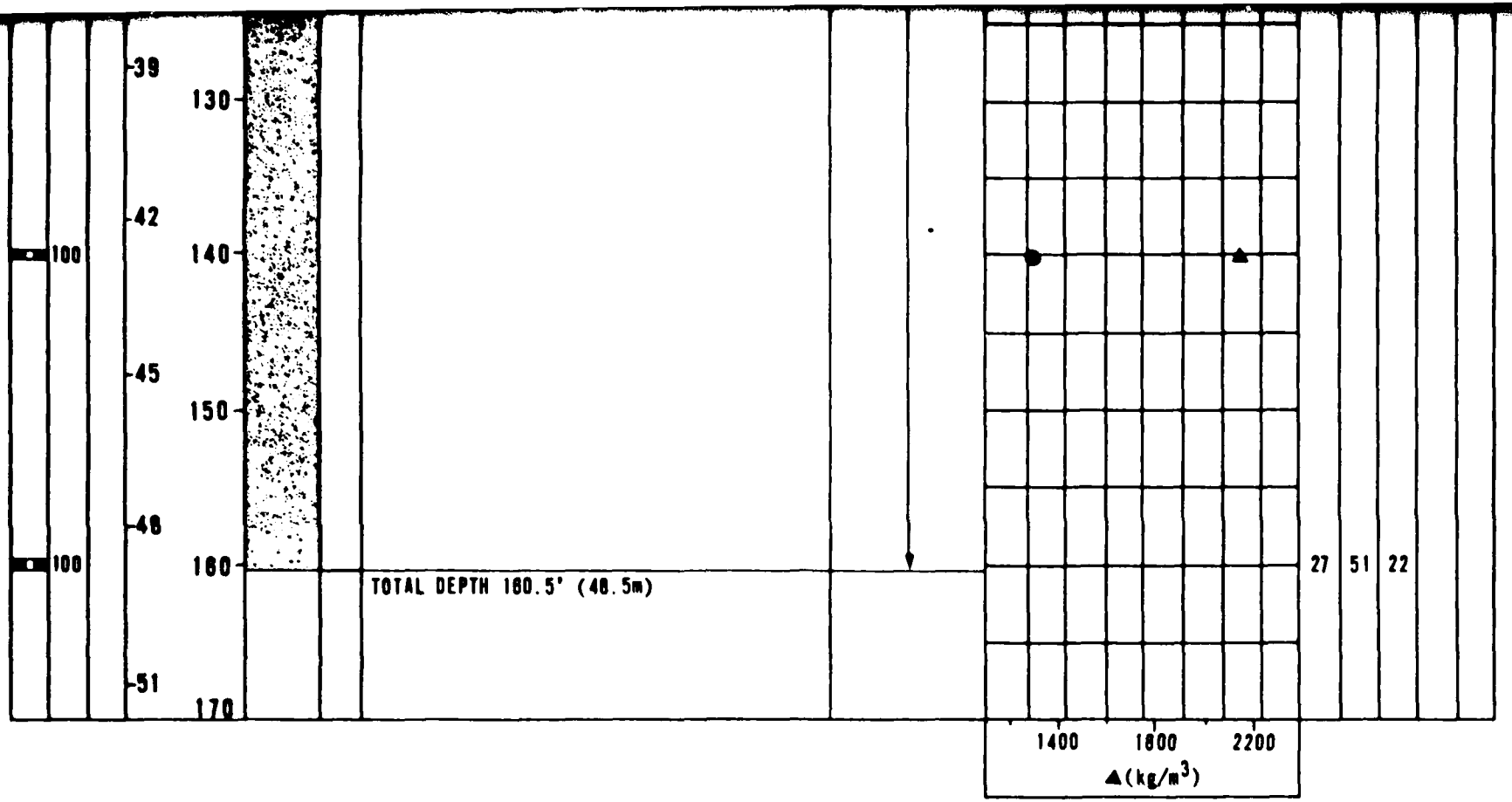



SP-
SM
SM
drill
chatter



EXPLANATION

- FUGRO DRIVE SAMPLE
- BULK SAMPLE
- PITCHER TUBE SAMPLE
- STANDARD PENETRATION TEST SAMPLE
- CORE SAMPLE
- N - STANDARD PENETRATION RESISTANCE
- ▲ - DRY UNIT WEIGHT (ASTM: D-2937-71)
- ● - MOISTURE CONTENT (ASTM: D-2216-71)
- NR - NO RECOVERY

BORING DETAILS

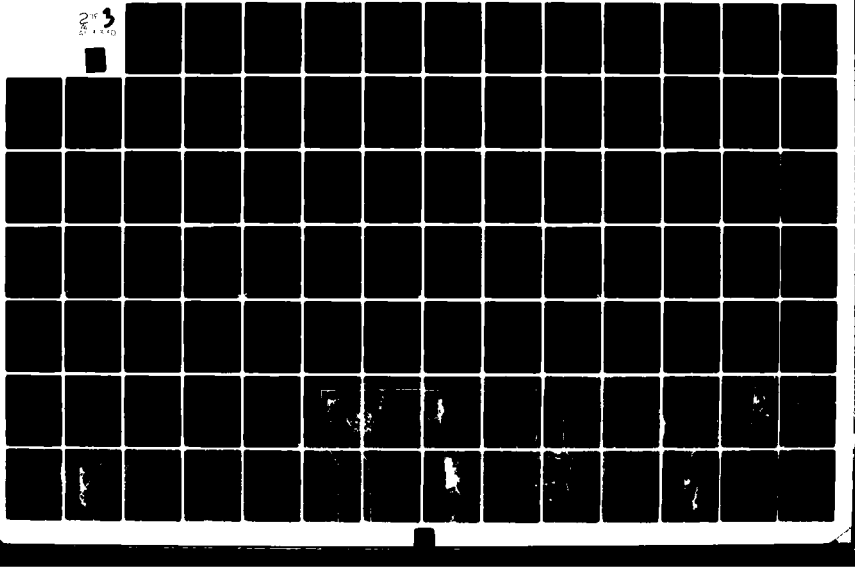
ELEVATION	: 5832' (1778m)
SURFICIAL GEOLOGIC UNIT	: A5y
DATE DRILLED	: 11 April 1979
DRILLING METHOD	: Rotary Wash
HOLE DIAMETER	: 4 7/8" (124mm)
WATER LEVEL	: Not Encountered

LOG OF BORING BS-8-6
VERIFICATION SITE, BIG SMOKY CRP, NEVADA
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO
FIGURE 8-6
FUGRO NATIONAL, INC.

SECTION 7.0

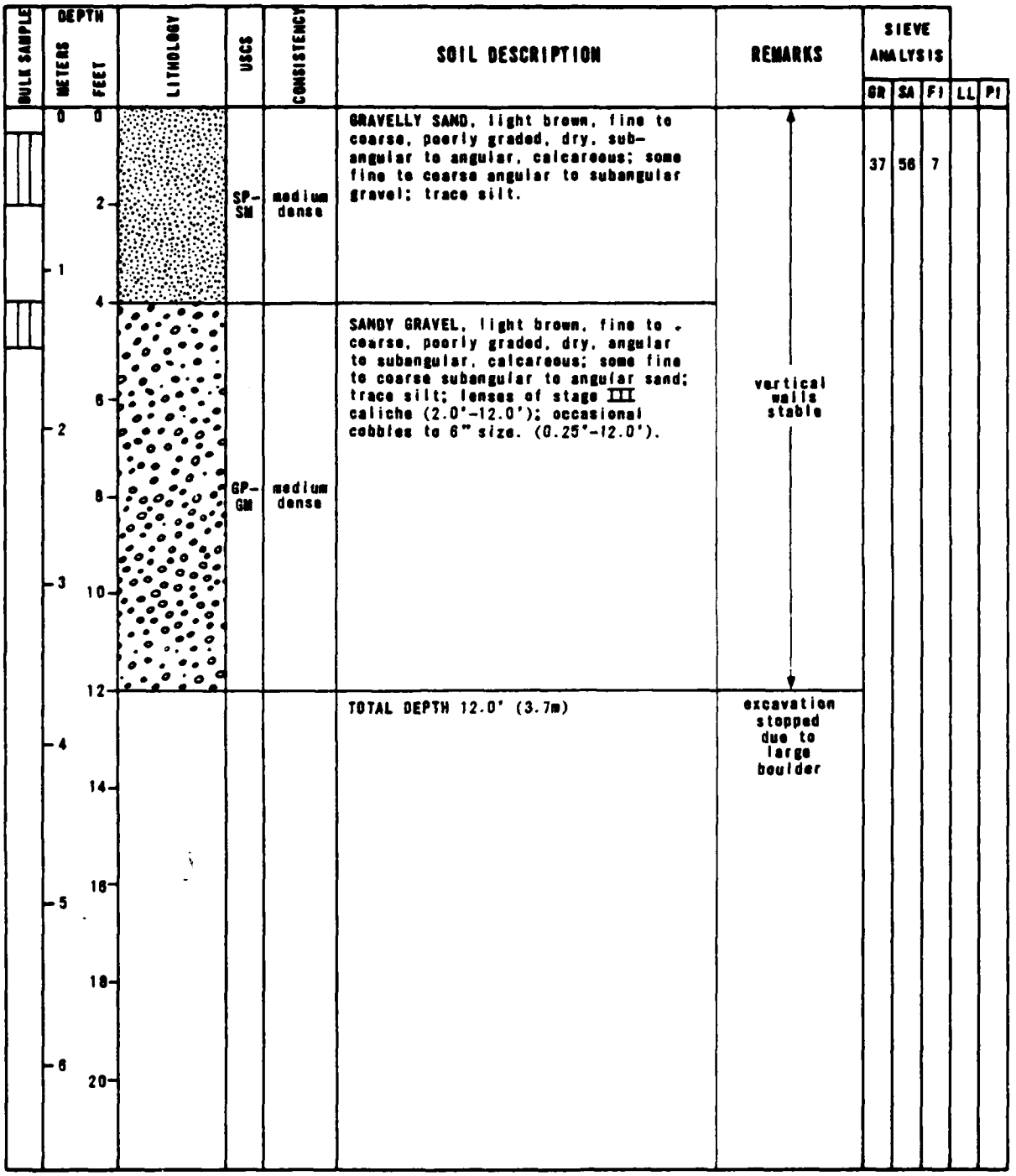
TRENCH AND TEST PIT LOGS

AD-A113 330 FUGRO NATIONAL INC . LONG BEACH CA F/G 8/13
MX SITING INVESTIGATION. GEOTECHNICAL EVALUATION. VOLUME VIII. --ETC(U)
AUG 79 F04704-80-C-0006
UNCLASSIFIED FN-TR-27-8 NL



EXPLANATIONS OF TRENCH AND TEST PIT LOGS

See Section 6.0, "Boring Logs", for explanations.



BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0										
		2		SP-SM	medium dense	GRAVELLY SAND, light brown, fine to coarse, poorly graded, dry, sub-angular to angular, calcareous; some fine to coarse angular to subangular gravel; trace silt.		37	56	7		
	1	4										
		6				SANDY GRAVEL, light brown, fine to coarse, poorly graded, dry, angular to subangular, calcareous; some fine to coarse subangular to angular sand; trace silt; lenses of stage III caliche (2.0'-12.0'); occasional cobbles to 6" size. (0.25'-12.0').	vertical walls stable					
	2											
		8		GP-GM	medium dense							
	3	10										
		12				TOTAL DEPTH 12.0' (3.7m)	excavation stopped due to large boulder					
	4	14										
	5	16										
		18										
	6	20										

TRENCH DETAILS

SURFACE ELEVATION : 5755' (1754m)
DATE EXCAVATED : 6 APRIL 1979
SURFICIAL GEOLOGIC UNIT : A5i
TRENCH LENGTH : 16.0' (5m)
TRENCH ORIENTATION : E - W

LOG OF TRENCH BS-T-1
VERIFICATION SITE, BIG SMOKY COP, NEVADA

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DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 7-1

FUGRO NATIONAL, INC.

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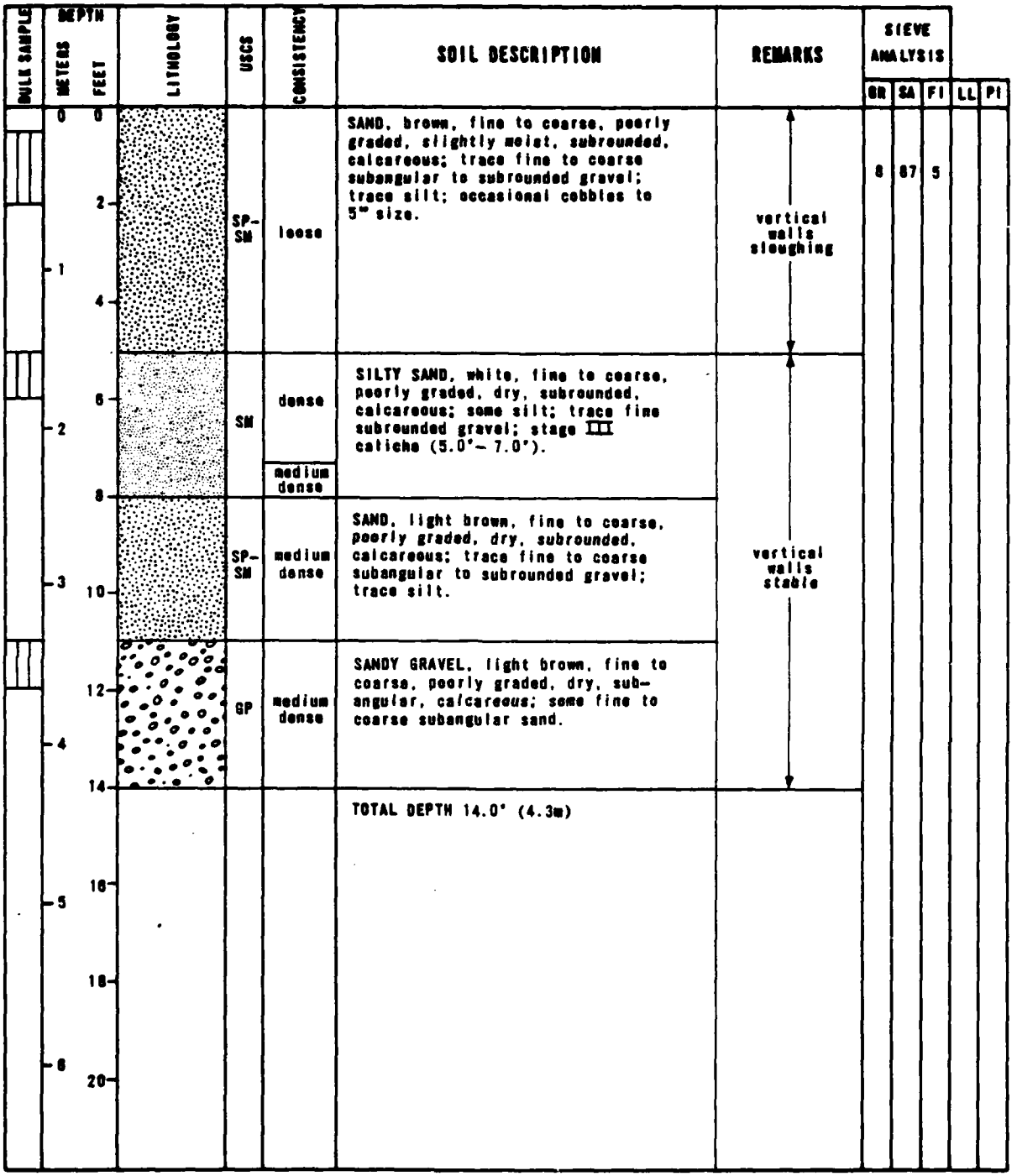

TRENCH DETAILS

SURFACE ELEVATION	: 5000' (1524m)
DATE EXCAVATED	: 7 APRIL 1979
SURFICIAL GEOLOGIC UNIT	: A5y/A3
TRENCH LENGTH	: 16.0' (5m)
TRENCH ORIENTATION	: NW – SE

LOG OF TRENCH BS-T-2
VERIFICATION SITE, BIG SMOKY COR, NEVADA

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FIGURE 7-2

FUGRO NATIONAL, INC.

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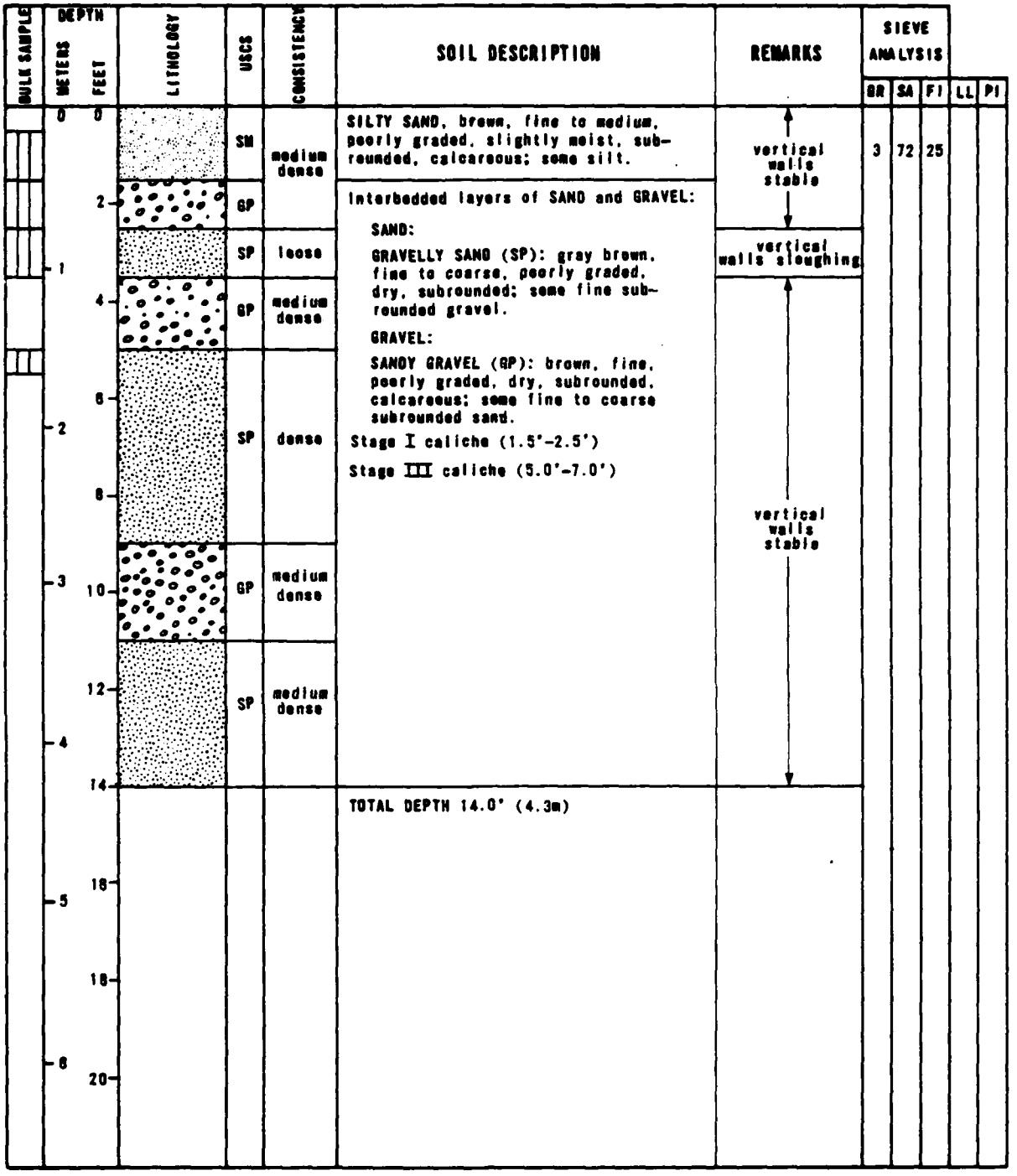
FN-TR-27-VIII



TRENCH DETAILS

SURFACE ELEVATION : 4892' (1491m)
DATE EXCAVATED : 7 APRIL 1979
SURFICIAL GEOLOGIC UNIT : A5y/A3
TRENCH LENGTH : 16.0' (5m)
TRENCH ORIENTATION : NW - SE

LOG OF TRENCH BS-T-3
VERIFICATION SITE, BIG SMOKY COR, NEVADA

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FIGURE 7-3

FUGRO NATIONAL, INC.

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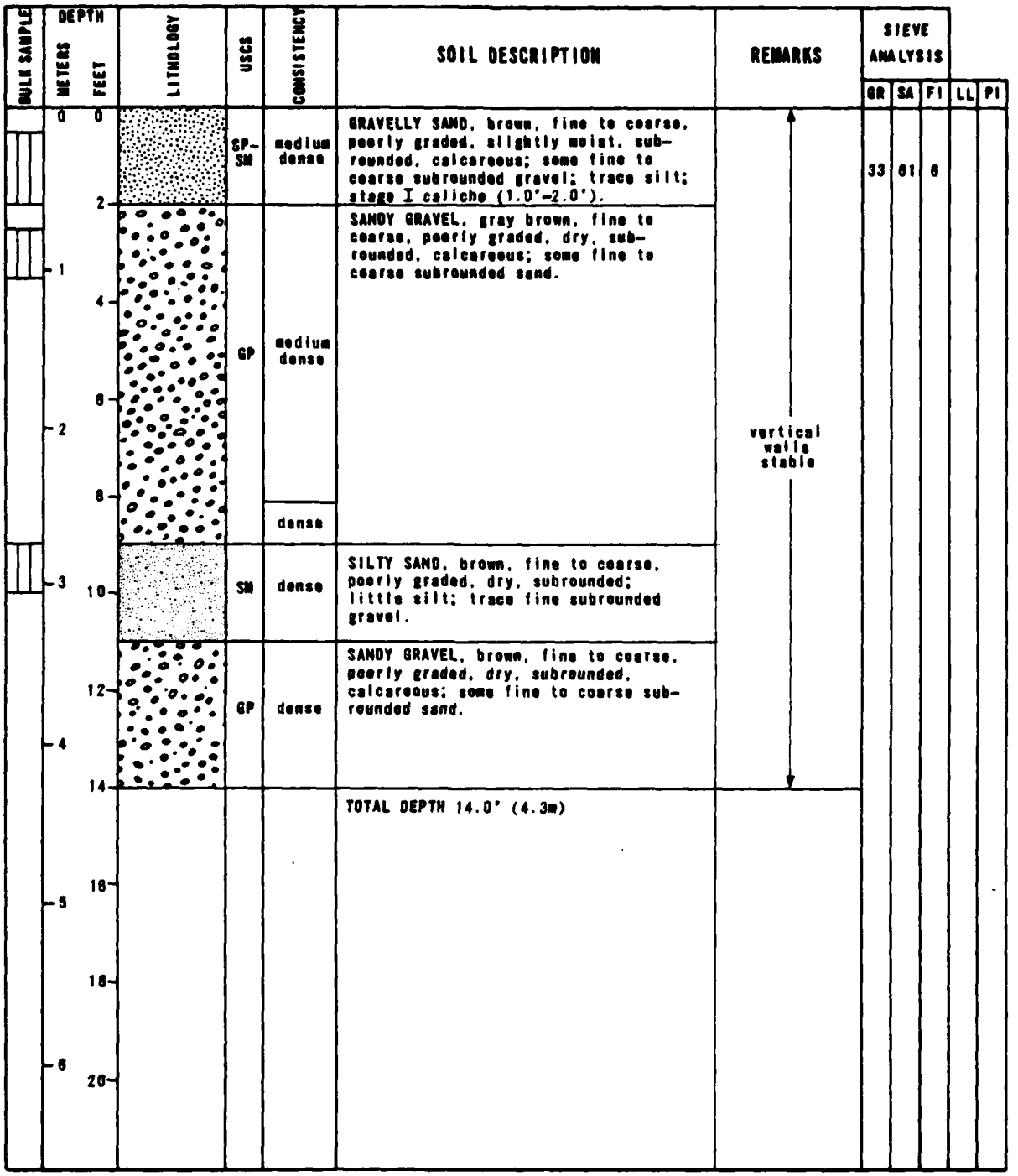

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0		SP-SM	medium dense	GRAVELLY SAND, brown, fine to coarse, poorly graded, slightly moist, subrounded, calcareous; some fine to coarse subrounded gravel; trace silt; stage I caliche (1.0'-2.0').	vertical walls stable	33	61	6		
		2		GP	medium dense	SANDY GRAVEL, gray brown, fine to coarse, poorly graded, dry, subrounded, calcareous; some fine to coarse subrounded sand.						
	1	4										
	2	8										
					dense							
	3	10		SM	dense	SILTY SAND, brown, fine to coarse, poorly graded, dry, subrounded; little silt; trace fine subrounded gravel.						
		12		GP	dense	SANDY GRAVEL, brown, fine to coarse, poorly graded, dry, subrounded, calcareous; some fine to coarse subrounded sand.						
	4	14				TOTAL DEPTH 14.0' (4.3m)						
	5	16										
		18										
	6	20										

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TRENCH DETAILS

SURFACE ELEVATION : 5108' (1557m)
DATE EXCAVATED : 8 APRIL 1979
SURFICIAL GEOLOGIC UNIT : Af
TRENCH LENGTH : 16.0' (5m)
TRENCH ORIENTATION : N - S

LOG OF TRENCH BS-T-4
VERIFICATION SITE, BIG SMOKY CDP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 7-4

WOODWARD-CLYDE CONSULTANTS

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0		SM	medium dense	GRAVELLY SAND, light brown, fine to coarse, poorly graded, slightly moist, subangular, calcareous; some fine to coarse subangular gravel; little nonplastic silt.	vertical walls stable	28	55	17		NP
		2										
	1	4		GP-GM	dense	SANDY GRAVEL, light brown, fine to coarse, poorly graded, dry, subangular, calcareous; some fine to coarse subangular sand; trace silt; stage III caliche (2.0'-7.0'); occasional cobbles to 5" size (2.0'-10.0').						
		6										
	2	8										
	3	10				TOTAL DEPTH 10.0' (3.0m)	soil strength exceeded capacity of Case 580C backhoe at 10.0'					
		12										
	4	14										
		16										
	5	18										
	6	20										

TRENCH DETAILS

SURFACE ELEVATION : 5375' (1638m)
DATE EXCAVATED : 9 APRIL 1979
SURFICIAL GEOLOGIC UNIT : A5I
TRENCH LENGTH : 16.0' (5m)
TRENCH ORIENTATION : NE - SW

LOG OF TRENCH BS-T-5
VERIFICATION SITE, BIG SMOKY CDP, NEVADA

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DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 7-5

FUGRO NATIONAL, INC.

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BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0				GRAVELLY SAND, light brown, fine to coarse, well graded, slightly moist, subrounded, calcareous; some fine to coarse subrounded gravel; trace non-plastic silt; stage I caliche (1.0'-3.0').		33	56	11		NP
		2										
	1	4										
		6										
	2			SW-SM	medium dense		vertical walls stable					
		8										
	3	10										
		12										
	4											
		14				TOTAL DEPTH 14.0' (4.3m)						
	5	16										
		18										
	6	20										

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TRENCH DETAILS

SURFACE ELEVATION : 6055' (1846m)
DATE EXCAVATED : 10 APRIL 1979
SURFICIAL GEOLOGIC UNIT : A5y
TRENCH LENGTH : 16.0' (5m)
TRENCH ORIENTATION : NW-SE

LOG OF TRENCH BS-T-6
VERIFICATION SITE, BIG SMOKY COP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 7-6

FUGRO NATIONAL, INC.

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0		SM	loose	SAND, brown, fine to coarse, poorly graded, slightly moist, subrounded, calcareous; little nonplastic silt; trace fine subrounded gravel.		11	70	19		NP
		1										
		2		SP-SM	medium dense	GRAVELLY SAND, light brown, fine to coarse, poorly graded, dry, subangular, calcareous; trace fine subangular gravel; trace silt.						
	1	3										
		4										
		5				TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 5355' (1632m)
SURFICIAL GEOLOGIC UNIT: A1

LOG OF TEST PIT BS-P-1

	0	0		SP-SM	medium dense	SAND, light brown, fine to coarse, poorly graded, slightly moist to dry, subangular, calcareous; trace to little subangular gravel; trace silt; stage III caliche (1.5'-2.5').						
		1										
		2			dense							
	1	3										
		4										
		5				TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 5281' (1610m)
SURFICIAL GEOLOGIC UNIT: A5I

LOG OF TEST PIT BS-P-2

LOGS OF TEST PITS BS-P-1 AND BS-P-2
VERIFICATION SITE, BIG SMOKY CDP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 7-7

UGRO NATIONAL, INC.

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BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0										
		1			medium dense	SAND, light brown, fine to coarse, poorly graded, slightly moist to dry, subrounded, calcareous; trace fine subrounded to subangular gravel; trace silt; stage III caliche (2.0'-3.0').						
		2		SP-SM	dense							
	1	3			medium dense							
		4										
		5				TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 5270' (1606m)
SURFICIAL GEOLOGIC UNIT: A5y

LOG OF TEST PIT BS-P-3

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0										
		1			medium dense	SAND, light brown, fine to coarse, poorly graded, dry, subangular, calcareous; trace fine subangular gravel; trace silt; stage III caliche (2.0'-3.0').						
		2		SP-SM	dense							
	1	3			medium dense							
		4										
		5				TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 5480' (1673m)
SURFICIAL GEOLOGIC UNIT: A5y

LOG OF TEST PIT BS-P-4

CHECKED BY _____ APPROVED BY _____

LOGS OF TEST PITS BS-P-3 AND BS-P-4
VERIFICATION SITE, BIG SMOKY COP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 7-8

FUGRO NATIONAL, INC.

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0		SP-SM	medium dense	GRAVELLY SAND, light brown, fine to coarse, poorly graded, dry, sub-angular to angular, calcareous; little fine to coarse subangular to angular gravel; trace silt.						
		1										
		2										
	1	3										
		4										
		5				TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 5640' (1719m)
SURFICIAL GEOLOGIC UNIT: A5y

LOG OF TEST PIT BS-P-5

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0		SP-SM	medium dense	GRAVELLY SAND, light brown, fine to coarse, poorly graded, dry, sub-rounded, calcareous; some fine sub-rounded to subangular gravel; trace silt; stage III caliche (1.2'-4.5')						
		1										
		2										
	1	3										
		4										
		5				TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 5380' (1640m)
SURFICIAL GEOLOGIC UNIT: A5i

LOG OF TEST PIT BS-P-8

CHECKED BY _____ APPROVED BY _____

LOGS OF TEST PITS BS-P-5 AND BS-P-6
VERIFICATION SITE, BIG SMOKY COP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 7-9

FUGRO NATIONAL, INC.

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0		SP-SM	loose	SAND, brown, fine to coarse, poorly graded, slightly mois'. subrounded, calcareous; trace silt; trace fine subrounded gravel.						
		1										
		2										
	1	3		GP	medium dense	SANDY GRAVEL, light brown, fine to coarse, poorly graded, dry, sub-rounded, calcareous; some fine to coarse subrounded sand; stage I caliche (2.5'-5.0').						
		4										
		5				TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 5015' (1529m)
SURFICIAL GEOLOGIC UNIT: A5y

LOG OF TEST PIT BS-P-7

	0	0		SM	medium dense	SILTY SAND, red brown, fine to coarse, poorly graded, slightly moist, sub-angular, calcareous; some silt; trace fine subangular gravel; stage II caliche (0.5'-5.0').						
		1										
		2										
	1	3		SP-SM	medium dense	SAND, light brown, fine to coarse, poorly graded, dry, subangular, calcareous; little fine subangular gravel; trace silt.						
		4										
		5				TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 4942' (1506m)
SURFICIAL GEOLOGIC UNIT: A5y

LOG OF TEST PIT BS-P-8

LOGS OF TEST PITS BS-P-7 AND BS-P-8
VERIFICATION SITE, BIG SMOKY COR, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE SAMSO

FIGURE 7-10

FUGRO NATIONAL, INC.

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0				SAND, gray brown, fine to coarse, poorly graded, dry, subangular, calcareous; trace fine to coarse subangular gravel; trace silt.						
		1						11	83	6		
		2		SP-SM	loose							
	1	3										
		4										
		5				TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 4882' (1488m)
SURFICIAL GEOLOGIC UNIT: A5y

LOG OF TEST PIT BS-P-9

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0				SILTY SAND, brown, fine to coarse, poorly graded, slightly moist, subangular, calcareous; little silt; trace fine subangular gravel; stage II caliche (1.0'-5.0').						
		1			medium dense							
		2		SM								
	1	3			dense							
		4										
		5				TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 5080' (1548m)
SURFICIAL GEOLOGIC UNIT: A5y

LOG OF TEST PIT BS-P-10

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LOGS OF TEST PITS BS-P-9 AND BS-P-10
VERIFICATION SITE, BIG SMOKY COP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 7-11

FUGRO NATIONAL, INC.

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BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0		SP-SM	loose	SAND, brown, fine to coarse, poorly graded, slightly moist, subrounded, calcareous; trace silt.						
		1										
		2										
	1	3										
		4										
		5				TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 4950' (1509m)
SURFICIAL GEOLOGIC UNIT: A5y/A3

LOG OF TEST PIT BS-P-11

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0		SP-SM	loose	SAND, brown, fine to coarse, poorly graded, slightly moist, subrounded, calcareous; trace silt; trace fine subrounded gravel; stage III caliche (1.5'-5.0').						
		1										
		2										
	1	3			dense							
		4										
		5				TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 4872' (1485m)
SURFICIAL GEOLOGIC UNIT: A5y/A3

LOG OF TEST PIT BS-P-12

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LOGS OF TEST PITS BS-P-11 AND BS-P-12
VERIFICATION SITE, BIG SMOKY CDP, NEVADA

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FIGURE 7-12

FUGRO NATIONAL, INC.

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BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0		SP	loose	SAND, brown, fine to medium, poorly graded, slightly moist, subrounded, calcareous.		0	97	3		
		1										
		2										
	1	3										
		4										
		5				TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 4985' (1522m)
SURFICIAL GEOLOGIC UNIT: A3

LOG OF TEST PIT BS-P-13

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0		SP-SM	loose	SAND, brown, fine to coarse, poorly graded, slightly moist, subangular to subrounded, calcareous; trace fine subangular to subrounded gravel; trace silt.						
		1										
		2										
	1	3		SP	medium dense	GRAVELLY SAND, brown, fine to coarse, poorly graded, dry, subangular, calcareous; some fine to coarse subangular gravel.						
		4										
		5				TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 5018' (1529m)
SURFICIAL GEOLOGIC UNIT: A5y/A3

LOG OF TEST PIT BS-P-14

CHECKED BY _____ APPROVED BY _____

LOGS OF TEST PITS BS-P-13 AND BS-P-14
VERIFICATION SITE, BIG SMOKY COP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 7-13

FUGRO NATIONAL, INC.

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BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0		SM	loose	SILTY SAND, light brown, fine to coarse, poorly graded, slightly moist, subrounded; little silt; trace fine subrounded gravel.		8	74	18		
	1			GP	medium dense	SANDY GRAVEL, gray brown, fine, poorly graded, slightly moist, subrounded; some fine to coarse subrounded sand.						
		1										
	2											
	3											
	4											
	5					TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 4910' (1497m)
SURFICIAL GEOLOGIC UNIT: A1/A4

LOG OF TEST PIT BS-P-15

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0		SP-SM	medium dense	SAND, light brown, fine, poorly graded, slightly moist, subrounded; trace silt.						
	1											
		1										
	2											
	3			GP	medium dense	SANDY GRAVEL, gray brown, fine, poorly graded, dry, subrounded; some fine to coarse subrounded sand.						
	4											
	5					TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 4903' (1494m)
SURFICIAL GEOLOGIC UNIT: A5y/A4

LOG OF TEST PIT BS-P-16

CHECKED BY _____ APPROVED BY _____

LOGS OF TEST PITS BS-P-15 AND BS-P-16
VERIFICATION SITE, BIG SMOKY COP, NEVADA

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DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 7-14

FUGRO NATIONAL, INC.

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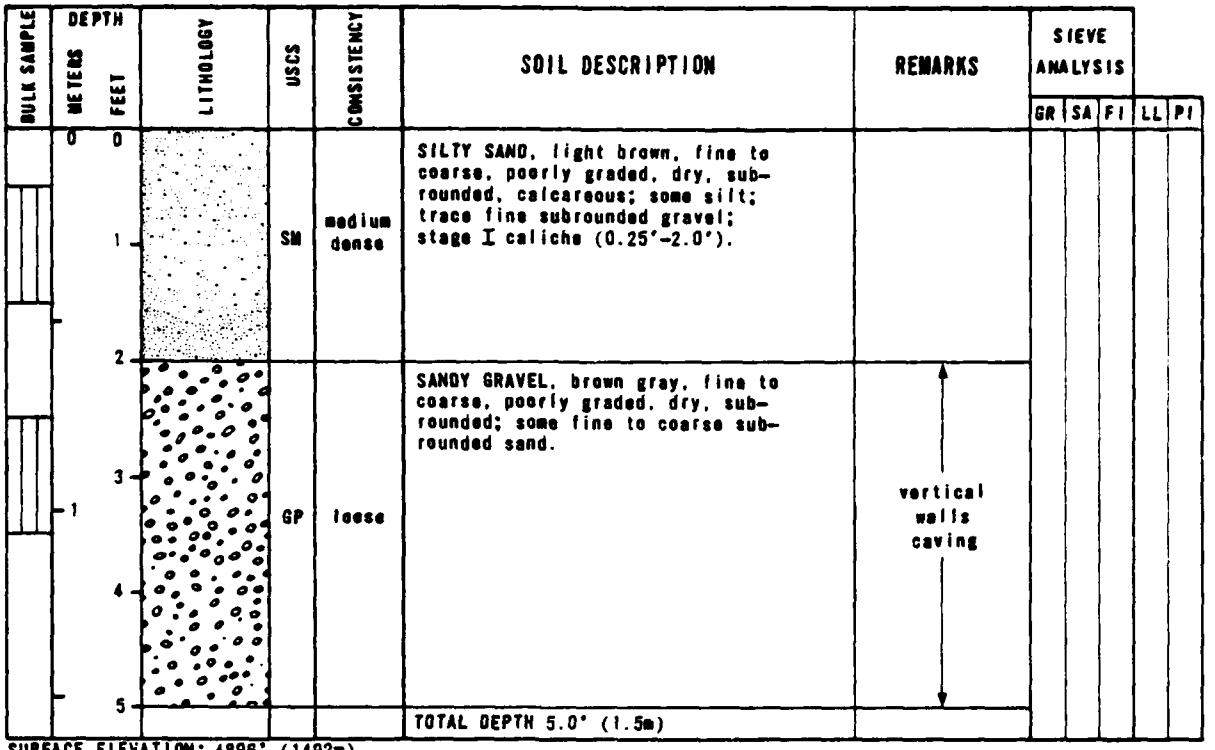
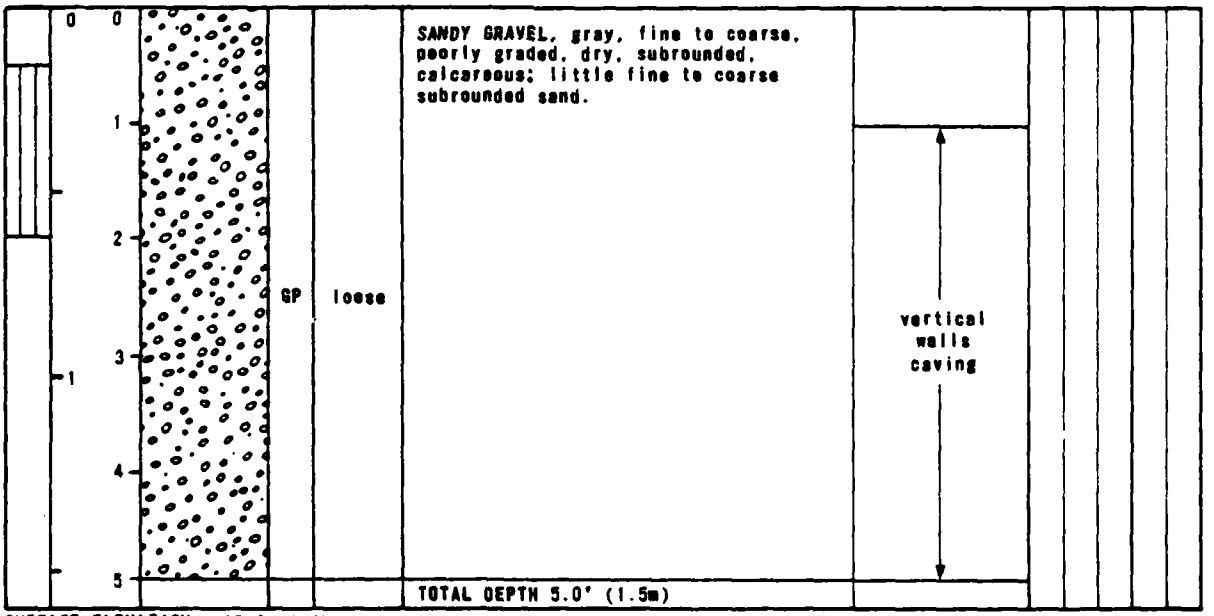


SURFACE ELEVATION: 4896' (1492m)
SURFICIAL GEOLOGIC UNIT: A5y/A4

LOG OF TEST PIT BS-P-17



SURFACE ELEVATION: 4878' (1487m)
SURFICIAL GEOLOGIC UNIT: A5y/A4

LOG OF TEST PIT BS-P-18

CHECKED BY _____ APPROVED BY _____

LOGS OF TEST PITS BS-P-17 AND BS-P-18
VERIFICATION SITE, BIG SMOKY COP, NEVADA

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FIGURE 7-15

FUGRO NATIONAL, INC.

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BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0		SC	medium dense	CLAYEY SAND, brown, fine to medium, poorly graded, slightly moist, subrounded, calcareous; some slightly plastic clay.						
		1										
		2		ML	firm	SANDY SILT, light brown, nonplastic; some fine to coarse subrounded sand; trace subrounded gravel.						
	1	3										
		4										
		5				TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 5014' (1528m)
SURFICIAL GEOLOGIC UNIT: A1

LOG OF TEST PIT BS-P-19

	0	0		SM	medium dense	SILTY SAND, brown, fine to coarse, poorly graded, slightly moist, subrounded, calcareous; some silt; trace fine subrounded gravel; stage II caliche (1.0'-2.0').						
		1										
		2		SP-SM	medium dense	SAND, brown, fine to coarse, poorly graded, dry, subrounded, calcareous; little fine subrounded gravel; trace silt.						
	1	3										
		4		SM	dense	SILTY SAND, light brown, fine to coarse, poorly graded, dry, subrounded, calcareous; some silt; trace fine subrounded gravel; stage II caliche (3.0'-5.0').						
		5				TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 5158' (1572m)
SURFICIAL GEOLOGIC UNIT: A5y

LOG OF TEST PIT BS-P-20

CHECKED BY _____ APPROVED BY _____

LOGS OF TEST PITS BS-P-19 AND BS-P-20
VERIFICATION SITE, BIG SMOKY CDP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 7-16

FUGRO NATIONAL, INC.

2 JUL 79

AFV-03

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0		SP-SM	loose	SAND, brown, fine to coarse, poorly graded, slightly moist, angular to subangular, calcareous; trace fine angular gravel; trace silt.						
	1	2										
		3		GP	medium dense	SANDY GRAVEL, light brown, fine to coarse, poorly graded, dry, sub-angular to angular, calcareous; some fine to coarse subangular to angular sand; stage I caliche (2.0'-5.0').						
	1	4										
		5				TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 5210' (1588m)
SURFICIAL GEOLOGIC UNIT: A5y

LOG OF TEST PIT BS-P-21

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0		GM	medium dense	SANDY GRAVEL, brown, fine, poorly graded, slightly moist to dry, sub-angular, calcareous; some fine to coarse subangular sand; little silt; stage II caliche (1.0'-5.0').						
	1	2			dense							
		3										
	1	4										
		5				TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 5510' (1679m)
SURFICIAL GEOLOGIC UNIT: A5f

LOG OF TEST PIT BS-P-22

LOGS OF TEST PITS BS-P-21 AND BS-P-22
VERIFICATION SITE, BIG SMOKY CDP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 7-17

FUGRO NATIONAL, INC.

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FM-TR-27-VIII

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0				GRAVELLY SAND, brown, fine to coarse, poorly graded, slightly moist, sub-angular, calcareous; some fine sub-rounded gravel; little silt.						
		1		SM	medium dense							
		2										
					medium dense	SANDY GRAVEL, brown to light brown, fine to coarse, poorly graded, slightly moist to dry, subangular, calcareous; some fine to coarse subangular sand; stage II caliche (2.5'-5.0').						
	1	3		GP								
		4			dense							
		5				TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 5512' (1680m)
SURFICIAL GEOLOGIC UNIT: A5y

LOG OF TEST PIT BS-P-23

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0				CLAYEY SAND, brown, fine to coarse, poorly graded, slightly moist to dry, subangular, calcareous; some medium plastic clay; some fine to coarse subangular gravel; stage II caliche (2.0'-5.0').		22	45	33	40	16
		1			medium dense							
		2		SC								
	1	3			very dense							
		4										
		5				TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 5400' (1646m)
SURFICIAL GEOLOGIC UNIT: A5i

LOG OF TEST PIT BS-P-24

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LOGS OF TEST PITS BS-P-23 AND BS-P-24
VERIFICATION SITE, BIG SMOKY COP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 7-18

FUGRO NATIONAL, INC.

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BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0		SP-SM	medium dense	SAND, brown, fine to coarse, poorly graded, slightly moist, subangular, calcareous; trace fine subangular gravel; trace silt.						
		1										
		2										
		3		SP	medium dense	SAND, gray, fine to coarse, poorly graded, dry, subrounded, calcareous; trace fine subrounded gravel.						
	1	4										
		5				TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 5370' (1637m)
SURFICIAL GEOLOGIC UNIT: A5y

LOG OF TEST PIT BS-P-25

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0		SM	loose	SILTY SAND, brown, fine to coarse, poorly graded, slightly moist, subrounded, calcareous; little silt; trace fine subrounded gravel.						
		1										
		2										
		3										
	1	4										
		5				TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 5338' (1627m)
SURFICIAL GEOLOGIC UNIT: A5y

LOG OF TEST PIT BS-P-26

CHECKED BY _____ APPROVED BY _____

LOGS OF TEST PITS BS-P-25 AND BS-P-26
VERIFICATION SITE, BIG SMOKY COP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 7-19

FUGRO NATIONAL, INC.

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BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0		SP-SM	loose	SAND, brown, fine to coarse, poorly graded, slightly moist, subrounded; trace silt.						
		1										
		2										
	1	3										
		4										
		5				TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 5550' (1692m)
SURFICIAL GEOLOGIC UNIT: A5y

LOG OF TEST PIT BS-P-27

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0		SM	medium dense	SILTY SAND, light brown, fine to coarse, poorly graded, dry, subrounded, calcareous; little silt; trace fine subrounded gravel; stage II caliche (1.0'-3.0').						
		1										
		2										
	1	3										
		4		GP	medium dense	SANDY GRAVEL, light brown, fine to coarse, poorly graded, dry, subrounded, calcareous; some fine to coarse subrounded sand.						
		5				TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 5755' (1754m)
SURFICIAL GEOLOGIC UNIT: A5i

LOG OF TEST PIT BS-P-28

CHECKED BY _____ APPROVED BY _____

LOGS OF TEST PITS BS-P-27 AND BS-P-28
VERIFICATION SITE, BIG SMOKY COP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 7-20

FUGRO NATIONAL, INC.

FN-TR-27-VIII

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0				GRAVELLY SAND, brown, fine to coarse, poorly graded, slightly moist, sub-rounded, calcareous; little fine subangular to angular gravel; trace silt.						
		1										
		2		SP-SM	loose							
	1	3										
		4										
		5				TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 5960' (1817m)
SURFICIAL GEOLOGIC UNIT: I4

LOG OF TEST PIT BS-P-29

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0				SILTY SAND, brown, fine to coarse, poorly graded, slightly moist, sub-rounded, calcareous; little silt; little fine to coarse subrounded gravel; stage II caliche (3.0'-5.0').		15	69	16		
		1										
		2		SM	medium dense							
	1	3										
		4										
		5				TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 5853' (1784m)
SURFICIAL GEOLOGIC UNIT: A5y

LOG OF TEST PIT BS-P-30

CHECKED BY _____ APPROVED BY _____

LOGS OF TEST PITS BS-P-29 AND BS-P-30
VERIFICATION SITE, BIG SMOKY COP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 7-21

FUGRO NATIONAL, INC.

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AFV-03

BULK SAMPLE	DEPTH METERS	DEPTH FEET	LITHOLOGY	USCS	CONSISTENCY	SOIL DESCRIPTION	REMARKS	SIEVE ANALYSIS GR	SA	FI	LL	PI
	0	0				SAND, brown, fine to coarse, poorly graded, slightly moist, subrounded, calcareous; trace silt; trace fine subrounded gravel; occasional cobbles to 6" size (3.0'-4.0').						
		1		SP-SM	loose							
	1	2										
		3										
		4		GP	loose	SANDY GRAVEL, gray, fine to coarse, poorly graded, dry, subangular, calcareous; some fine to coarse subangular to subrounded sand; occasional cobbles to 6" size.	vertical walls caving					
		5				TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 5760' (1756m)
SURFICIAL GEOLOGIC UNIT: A5y

LOG OF TEST PIT BS-P-31

	0	0		SC	medium dense	CLAYEY SAND, brown, fine to coarse, poorly graded, slightly moist, subrounded, calcareous; some slightly plastic clay; trace fine subrounded gravel.						
		1										
		2		GP	medium dense	SANDY GRAVEL, light brown, fine to coarse, poorly graded, slightly moist, subrounded, calcareous; some fine to coarse subrounded sand; stage I caliche (1.0'-2.0').						
	1	3										
		4										
		5				TOTAL DEPTH 5.0' (1.5m)						

SURFACE ELEVATION: 6170' (1881m)
SURFICIAL GEOLOGIC UNIT: A5i

LOG OF TEST PIT BS-P-32

CHECKED BY _____ APPROVED BY _____

LOGS OF TEST PITS BS-P-31 AND BS-P-32
VERIFICATION SITE, BIG SMOKY CDP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 7-22

FUGRO NATIONAL, INC.

SECTION 8.0

SURFICIAL SAMPLE LOGS

ACTIVITY NUMBER	GROUND SURFACE ELEVATION, FEET (METERS)	SURFICIAL GEOLOGIC UNIT	DEPTH, FEET (METERS)	USCS	SOIL DESCRIPTION	SIEVE ANALYSIS				
						GR	SA	FI	LL	PI
BS-CS-4	5242 (1598)	A5i	0.0-2.0 (0.0-0.6)	SM	SILTY SAND, light brown, fine to coarse, poorly graded, subangular, calcareous; some nonplastic silt; trace fine gravel; stage II caliche (1.0'-2.0').	5	72	23		NP
BS-CS-5	5230 (1594)	A5y	0.0-2.0 (0.0-0.6)	SP	SAND, light brown, fine to coarse, poorly graded, subangular, calcareous; trace fine gravel.					
BS-CS-7	5360 (1634)	A5y	0.0-2.0 (0.0-0.6)	SM	SILTY SAND, light brown, fine to coarse, poorly graded, subangular, calcareous; little silt; trace fine gravel; stage II caliche (1.0'-2.0')	5	77	18		
BS-CS-11	5300 (1615)	A5i	0.0-2.0 (0.0-0.6)	GP-GM	SANDY GRAVEL, brown, fine to coarse, poorly graded, subrounded, calcareous; some fine to coarse sand; trace silt.	63	32	5		
BS-CS-13	5105 (1556)	A5y	0.0-1.0 (0.0-0.3)	SM	SILTY SAND, brown, fine to coarse, poorly graded, subrounded, calcareous; little silt; little fine gravel.					
			1.0-2.0 (0.3-0.6)	GP	SANDY GRAVEL, light brown, fine, poorly graded, subrounded, calcareous; some fine to coarse sand; stage II caliche (1.0'-2.0').					
BS-CS-15	4980 (1521)	A1	0.0-2.0 (0.0-0.6)	SP	SAND, light brown, fine to coarse, poorly graded, subrounded, calcareous.					
BS-CS-16	4974 (1516)	A5y	0.0-2.0 (0.0-0.6)	SP-SM	SAND, brown, fine to coarse, poorly graded, subrounded, calcareous; trace silt.					
BS-CS-18	4920 (1500)	A5y	0.0-2.0 (0.0-0.6)	SP-SM	SAND, light brown, fine to coarse, poorly graded, subrounded, calcareous; trace silt; occasional cobbles to 5" size (1.0'-2.0').					
BS-CS-20	4855 (1480)	A5y	0.0-2.0 (0.0-0.6)	SM	SILTY SAND, light brown, fine to coarse, poorly graded, subangular to angular, calcareous; little silt; trace fine gravel; stage II caliche (0.75'-1.5'); stage III caliche (1.5'-2.0')					

LOGS OF SURFICIAL SOIL SAMPLES
VERIFICATION SITE,
BIG SMOKY COP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 8-1 1 OF 4

FUGRO NATIONAL, INC.

ACTIVITY NUMBER	GROUND SURFACE ELEVATION, FEET (METERS)	SURFICIAL GEOLOGIC UNIT	DEPTH, FEET (METERS)	USCS	SOIL DESCRIPTION	SIEVE ANALYSIS				
						GR	SA	FI	LL	PI
BS-CS-24	4880 (1487)	A5y/A3	0.0-0.5 (0.0-0.2)	SC	CLAYEY SAND, brown, fine to coarse, poorly graded, subangular, calcareous; some slightly plastic clay; trace fine gravel.					
			0.5-2.0 (0.2-0.6)	SM	SILTY SAND, brown, fine to coarse, poorly graded, subangular, calcareous; some silt; trace fine gravel; stage III caliche (0.9'-1.2').					
BS-CS-27	5080 (1548)	A3	0.0-2.0 (0.0-0.6)	SP	SAND, brown, fine to coarse, poorly graded, subrounded.					
BS-CS-28	4925 (1501)	A5y/A3	0.0-2.0 (0.0-0.6)	SM	SILTY SAND, brown, fine to coarse, poorly graded, subrounded, calcareous; little silt.					
BS-CS-29	4870 (1484)	A5y/A4	0.0-2.0 (0.0-0.6)	SP-SM	SAND, brown, fine to medium, poorly graded, subrounded, calcareous; trace silt.					
BS-CS-30	4878 (1487)	A5y/A3	0.0-2.0 (0.0-0.6)	SP-SM	SAND, brown, fine to coarse, poorly graded, subrounded, calcareous; trace silt.					
BS-CS-31	4888 (1489)	A5y/A3	0.0-2.0 (0.0-0.6)	SP	SAND, light brown, fine to coarse, poorly graded, subrounded, calcareous; trace fine gravel.					
BS-CS-34	4938 (1505)	A5y/A3	0.0-2.0 (0.0-0.6)	SM	SILTY SAND, light brown, fine to coarse, poorly graded, subangular, calcareous; some silt; trace fine gravel; stage I caliche (1.0'-2.0').					
BS-CS-38	4917 (1499)	A1/A4	0.0-2.0 (0.0-0.6)	SM	SILTY SAND, light brown, fine to coarse, poorly graded, subangular to subrounded, calcareous; little silt; trace fine gravel; stage I caliche (0.75'-2.0').					
BS-CS-42	4887 (1490)	A1/A4	0.0-2.0 (0.0-0.6)	GP-GM	SANDY GRAVEL, light brown, fine, poorly graded, calcareous; some fine to coarse sand; trace silt.					

LOGS OF SURFICIAL SOIL SAMPLES
VERIFICATION SITE,
BIG SMOKY COP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 8-1
2 OF 4

FUGRO NATIONAL, INC.

ACTIVITY NUMBER	GROUND SURFACE ELEVATION, FEET (METERS)	SURFICIAL GEOLOGIC UNIT	DEPTH, FEET (METERS)	USCS	SOIL DESCRIPTION	SIEVE ANALYSIS				
						GR	SA	FI	LL	PI
BS-CS-44	4958 (1511)	A5y	0.0-2.0 (0.0-0.6)	SM	SILTY SAND, brown, fine to coarse, poorly graded, subangular; some silt; trace fine gravel; stage I caliche (1.0'-2.0').					
BS-CS-47	5030 (1533)	A1	0.0-1.0 (0.0-0.3)	SC	CLAYEY SAND, brown, fine to coarse, poorly graded, subrounded calcareous; some slightly plastic clay; trace fine gravel.					
			1.0-2.0 (0.3-0.6)	ML	SANDY SILT, light brown, slightly plastic, calcareous; little fine sand; stage II-III caliche (1.0'-2.0').					
BS-CS-49	5125 (1562)	A1	0.0-2.0 (0.0-0.6)	SM	SILTY SAND, brown, fine to coarse, poorly graded, subrounded; some silt, trace fine gravel.					
BS-CS-54	5438 (1658)	A5i	0.0-2.0 (0.0-0.6)	SP	GRAVELLY SAND, brown, fine to coarse, poorly graded, subangular, calcareous; some fine gravel.	13	83	4		
BS-CS-61	5362 (1634)	A5y	0.0-1.5 (0.0-0.5)	SM	SILTY SAND, brown, fine to coarse, poorly graded, subangular, calcareous; some silt; trace fine gravel					
			1.5-2.0 (0.5-0.6)	SP	GRAVELLY SAND, gray brown, fine to coarse, poorly graded, subrounded, calcareous; little fine gravel; stage I caliche (0.5'-2.0').					
BS-CS-63	5355 (1632)	A5y	0.0-2.0 (0.0-0.6)	SP	GRAVELLY SAND, brown, fine to coarse, poorly graded, subangular, calcareous; little fine gravel.					
BS-CS-64	5330 (1625)	A5y	0.0-1.5 (0.0-0.5)	SC	CLAYEY SAND, brown, fine to coarse, poorly graded, subrounded, calcareous; some slightly plastic clay; trace fine gravel.					
			1.5-2.0 (0.5-0.6)	SM	SILTY SAND, white, fine to coarse, poorly graded, subrounded, calcareous; some silt; trace fine gravel.					
BS-CS-68	5615 (1711)	A5y	0.0-2.0 (0.0-0.6)	SP-SM	SAND, brown, fine to coarse, poorly graded, subrounded; trace silt; trace fine gravel.					

LOGS OF SURFICIAL SOIL SAMPLES
VERIFICATION SITE,
BIG SMOKY COP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 8-1
3 OF 4

FUGRO NATIONAL, INC.

ACTIVITY NUMBER	GROUND SURFACE ELEVATION, FEET (METERS)	SURFICIAL GEOLOGIC UNIT	DEPTH, FEET (METERS)	USCS	SOIL DESCRIPTION	SIEVE ANALYSIS				
						GR	SA	FI	LL	PI
BS-CS-70	5840 (1780)	A1	0.0-2.0 (0.0-0.6)	SP	SAND, brown, fine to coarse, poorly graded, subrounded; trace fine gravel.					
BS-CS-72	5832 (1778)	A5y	0.0-2.0 (0.0-0.6)	SP	SAND, brown, fine to coarse, poorly graded, subangular to subrounded, calcareous; little fine gravel.					
BS-CS-73	5955 (1815)	A5y	0.0-2.0 (0.0-0.6)	SP-SM	SAND, brown, fine to coarse, poorly graded, subrounded, calcareous; trace silt; trace fine gravel.					
BS-CS-79	5720 (1743)	A5y	0.0-1.0 (0.0-0.3)	SC	CLAYEY SAND, brown, fine to coarse, poorly graded, subrounded; some slightly plastic clay; trace fine gravel.					
			1.0-2.0 (0.3-0.6)	GP	SANDY GRAVEL, brown, fine to coarse, poorly graded, subrounded; some fine to coarse sand.					
BS-CS-80	5760 (1758)	A5y	0.0-2.0 (0.0-0.6)	GP	SANDY GRAVEL, brown, fine to coarse poorly graded, subrounded, calcareous; little fine to coarse sand.					

LOGS OF SURFICIAL SOIL SAMPLES
VERIFICATION SITE,
BIG SMOKY CDP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 8-1
4 OF 4

FUGRO NATIONAL, INC.

SECTION 9.0

LABORATORY TEST RESULTS

EXPLANATIONS OF LABORATORY TEST RESULTS

Laboratory test results are presented in this section. Table 9-1 contains a summary of laboratory test results. This table contains results of sieve analysis; plasticity data; in-situ dry unit weight, moisture content, degree of saturation, and void ratio for drive and Pitcher samples; results of compaction tests; and specific gravity of solids. Other tests such as triaxial compression, unconfined compression, direct shear, consolidation, chemical, and California Bearing Ratio (CBR) are indicated on the table. Tables 9-2 through 9-6 and Figures 9-1 through 9-3 present results of triaxial compression, unconfined compression, direct shear, consolidation, chemical, and CBR tests.

All tests were performed in general accordance with the American Society for Testing and Materials (ASTM) procedures. The following table presents the ASTM designations for the tests performed during the investigation.

Type of Test	ASTM Designations
Particle Size Analysis	D 422-63
Liquid Limit	D 423-66
Plastic Limit	D 424-59
Unit Weight	D 2937-71
Moisture Content	D 2216-71
Compaction	D 1557-70
Specific Gravity of Solids	D 854-58
Triaxial	D 2850-70
Unconfined Compression	D 2166-66
Direct Shear	D 3080-72
Consolidation	D 2435-70
Test for Alkalinity (pH)	D 1067-70
Water Soluble Sodium	D 1428-64
Water Soluble Chloride	D 512-67
Water Soluble Sulphate	D 516-68
Water Soluble Calcium	D 511-72
Calcium Carbonate	D 1126-67
California Bearing Ratio (CBR)	D 1883-73

Explanation for the tables and figures presented in this section are as follows.

A. Activity Number - Boring, trench, test pit, or surficial sample designation.

B. Sample Number - Prefix indicates the type of sample; explanation is at the bottom of the table.

C. Sample Interval - This is the depth range measured from ground surface over which the sample was obtained.

D. Percent Finer by Weight - Presents the results of laboratory particle size analysis (ASTM D 422-63) performed on representative soil samples at the depth indicated. The numbers represent the percent (by dry weight) of the total sample weight passing through each sieve size indicated.

E. Atterberg Limits (ASTM D 423-66 and D 424-59)

LL - Liquid Limit, the water content (as percent of soil dry weight) corresponding to the arbitrary limit between the liquid and plastic states of consistency of a soil (ASTM D 423-66).

PL - Plastic Limit, the water content corresponding to an arbitrary limit between the plastic and the semisolid state of consistency of a soil (ASTM D 424-59).

PI - Plasticity Index, numerical difference between the liquid limit (LL) and the plastic limit (PL) indicating the range of moisture content within which a soil-water mixture is plastic.

NP - Nonplastic.

F. USCS - Unified Soil Classification Symbols are given here; see Table 6.1 in Section 6.0, "Boring Logs", for complete details of USCS system.

G. In Situ - Presents results of tests on drive and Pitcher samples.

Dry Unit Weight - indicates dry unit weight of soil determined as per ASTM D 2937-71

Moisture Content - weight of water reported in percent of dry weight of soil sample (ASTM D 2216-71)

Saturation - the degree of saturation in a soil sample is defined as the ratio (in percent) of the volume of water to the volume of all voids in the soil

Void Ratio - the numerical ratio of the volume of voids to the volume of solids in a soil specimen

H. Compacted - Indicates results of laboratory maximum dry density and optimum moisture content test as per ASTM D 1557-70.

I. Specific Gravity of Solids (ASTM D 854-58) - Indicates the ratio of (1) the weight in air of a given volume of soil solids at a stated temperature, to (2) the weight in air of an equal volume of distilled water at a stated temperature.

J. Triaxial - The triaxial compression tests were performed in accordance with the procedures of ASTM D 2850-70. The following explanations and definitions apply.

Triaxial Compression Test - a cylindrical specimen of soil is surrounded by a fluid in a pressure chamber and subjected to an isotropic pressure. An additional compressive load is then applied, directed along the axis of the specimen called the axial load.

Consolidated-Drained (CD) Test - a triaxial compression test in which the soil was first consolidated under an all-around confining stress (test chamber pressure), and was then compressed (and hence sheared) by increasing the

vertical stress. Drained indicates that excess pore water pressure generated by strains are permitted to dissipate by the free movement of pore water during consolidation and compression.

Consolidated-Undrained (CU) Test - a triaxial compression test in which essentially complete consolidation under the confining (chamber) pressure is followed by a shear test at constant water content.

Confining Pressure (σ_3) - the isotropic chamber pressure applied to the soil specimen during consolidation and compression.

Maximum Deviator Stress ($\sigma_1-\sigma_3$) - the difference between the major and minor principal stresses in the specimen at failure. The major principal stress on the specimen is equal to the unit axial load plus the chamber pressure and the minor principal stress on the specimen is equal to the chamber pressure.

Strain Rate - axial strain, ε, at a given stress level is defined as the ratio of the change in length (ΔL) of the specimen to the original length of the specimen (L_o). The rate of strain was controlled during the test so that this ratio increased at equal increments for each minute of testing.

Back Pressure - pressure in excess of atmospheric applied to the pore water of a soil sample. Back pressure is usually applied to (1) increase saturation of the sample, or (2) simulate the actual in-situ pressure regime.

K. Unconfined Compression - Test procedures were as described in ASTM D 2166-66. Unconfined compressive strength is defined as the load per unit area at which an unconfined prismatic or cylindrical specimen of soil will fail in a simple compression test. In these methods, unconfined compressive strength is taken as the maximum load attained per unit area or the load per unit area at 20 percent axial strain, whichever occurred first during the performance of a test.

L. Direct Shear - The procedures of ASTM D 3080-72 were followed for direct shear testing. In this test, soil under an applied normal load is stressed to failure by moving one section of the soil container (shear box) relative to the other section. Normal stress is the value of load per unit area acting perpendicular to the plane of shearing. Maximum shear strength is defined as the maximum resistance (ksf) of a soil to shearing (tangential) stresses.

M. Consolidation (ASTM D 2435-70) - A consolidation test is a test in which a cylindrical soil specimen is laterally confined in a ring and compressed between porous plates. The term "consolidation", as used here, indicates the gradual reduction in volume of the soil mass resulting from an increase in compressive stress (axial load per unit area).

N. Chemical - The chemical tests performed on soil samples included: pH; water soluble sodium, chloride, sulphate, calcium; and calcium carbonate content. pH is an index of the acidity or alkalinity of a soil in terms of the logarithm of the reciprocal of the hydrogen ion concentration. ASTM test procedure designations for these chemical tests are included in the table at the beginning of the "Explanation of Laboratory Test Results".

O. CBR - California Bearing Ratio (CBR) is the ratio (in percent) of the resistance to penetration developed by a subgrade soil to that developed by a standard crushed-rock

base material. The procedures for conducting a CBR test were as outlined in ASTM D 1883-73. The materials tested for CBR were also analyzed for particle size distribution (ASTM D 422-63) and compaction characteristics (ASTM D 1557-70). The term "percentage of maximum density" indicates the ratio (as a percentage) of the compacted sample dry unit weight to maximum dry density obtained in the laboratory from ASTM D 1557-70, "Moisture-Density Relations of Soils Using 10-pound (4.5 kg) Hammer and 18-inch (457 mm) Drop".

ACTIVITY NUMBER	SAMPLE NUMBER (a)	SAMPLE INTERVAL		PERCENT FINER BY WEI								
				STANDARD SIEVE OPENING							U S S	
				BLDRS.	COBBLES		GRAVEL					
		FEET	METERS	24"	12"	8"	3"	1½"	3/4"	3/8"	4	1
BS-B-1	P-1	0.0-1.8	0.00-0.55									
	D-3	3.9-4.6	1.19-1.40									
	D-4	7.1-7.8	2.16-2.38									
	D-5	10.2-10.9	3.11-3.32									
	D-6	15.0-15.6	4.57-4.75						100	95	84	6
	P-7	20.7-21.4	6.31-6.52						100	97	87	7
	P-8	25.0-25.9	7.62-7.89									
	P-9	30.0-30.9	9.14-9.42									
	P-10	35.0-36.4	10.67-11.09									
	P-11	40.0-40.7	12.19-12.41									
	P-12	50.0-50.4	15.24-15.36									
	P-13	50.4-51.3	15.36-15.64									
	P-14	60.0-61.0	18.29-18.59									1
	P-15	70.0-72.3	21.34-22.04									
	P-16	80.0-81.1	24.38-24.72									
	P-17	90.0-91.5	27.43-27.89									
	P-18	100.0-101.2	30.48-30.85									
	P-19	110.0-111.8	33.53-34.08								100	9
	P-20	120.8-122.2	36.82-37.34									
	P-21	140.0-141.1	42.67-43.01								100	9
	P-22	160.0-162.1	48.77-49.41									
BS-B-2	P-1	0.0-0.4	0.00-0.12									
	b-3	2.5-3.0	0.76-0.91									
	D-4	3.7-4.4	1.13-1.34									
	D-6	7.0-7.5	2.13-2.29									
	D-7	10.0-10.7	3.05-3.26									
	D-8	15.7-16.4	4.79-5.00							100	98	9
	D-9	20.2-20.9	6.16-6.37									
	D-10	25.2-25.9	7.68-7.89									
	D-11	30.0-30.5	9.14-9.30				100	81	66	61	57	5
	D-12	35.2-35.9	10.73-10.94									
	D-13	40.0-40.5	12.19-12.34									
	P-14	50.0-52.7	15.24-16.06									
	P-15	60.0-61.4	18.29-18.71									
	P-16	61.4-62.2	18.71-18.96							100	99	9
	D-17	72.0-72.6	21.95-22.13						100	96	86	7
	D-18	80.0-80.3	24.38-24.48									
	D-19	90.2-90.9	27.49-27.71									
	D-20	101.5-101.9	30.94-31.06					100	97	82	64	4
	D-21	110.0-110.4	33.53-33.65									
	D-22	120.2-120.9	36.64-36.65						100	99	98	9
	D-23	140.0-140.5	42.67-42.82									

NOTES:

(a) Sample types
- SS - Standard split spoon
- P - Pitcher
- D - Fugro Drive
- B,b - Bulk

(b) NP - Not Plastic

(c) USCS - Unified Soil Classification System

(d) * Indicates that test has been performed and results are included in this report

CHECKED BY _____ APPROVED BY _____

RCENT FINER BY WEIGHT									ATTERBERG LIMITS (b)			USCS (c)	IN-SITU					COMPACTED		
		U S STANDARD SIEVE NO					PARTICLE SIZE (mm)						DRY UNIT WEIGHT		MOISTURE CONTENT (%)	SATURATION (%)	VOID RATIO	MAXIMUM DRY DENSITY		OPTIMUM MOISTURE
		SAND				SILT OR CLAY														
/4"	3 8"	4	10	40	100	200	.005	.001	LL	PL	PI		(pcf)	(kg m^3)				(pcf)	(kg m^3)	
												SP-SM	92.4	1480	9.5	31.1	0.82			
												SM	108.7	1741	4.6	22.6	0.55			
												SM	105.9	1696	8.1	37.2	0.59			
												SM	103.4	1656	6.3	27.0	0.63			
00	95	84	62	33	21	15						SM	113.5	1818	10.8	60.1	0.48			
00	97	87	76	39	19	12						SP-SM	102.3	1639	9.0	37.5	0.65			
												SP-SM	109.1	1748	9.9	49.5	0.54			
									110	62	48	MH	49.4	791	78.4	89.4	2.28			
												ML-MH	70.5	1129	46.7	93.4	1.30			
									50	37	13	ML-MH	79.6	1275	32.8	79.3	1.04			
												ML-MH	97.3	1559	6.0	22.2	0.73			
												ML-MH	77.7	1245	32.4	74.8	1.17			
			100	92	81	46						SM	87.5	1402	21.8	63.4	0.93			
									72	48	24	MH	65.4	1048	57.1	97.9	1.58			
												MH	74.4	1192	49.7	106.1	1.27			
									98	35	63	CH	85.6	1371	34.4	94.7	0.97			
												CH	70.9	1136	42.0	82.4	1.38			
		100	97	90	84	64						ML	59.1	947	16.5	24.0	1.85			
												ML	86.6	1387	33.4	95.5	0.95			
		100	98	88	83	56					NP	ML	94.4	1512	19.1	65.7	0.79			
												ML	57.9	927	78.2	100.0	1.91			
												SP-SM								
												SP-SM								
												SP-SM	115.7	1853	2.8	16.9	0.46			
												SP-SM	117.9	1889	10.9	68.6	0.43			
												SM	113.4	1817	5.9	32.8	0.49			
	100	98	93	75	23	7						SP-SM	106.3	1703	4.9	22.8	0.59			
												SP-SM	112.1	1796	4.9	26.6	0.50			
												SP-SM	111.6	1788	6.4	34.2	0.51			
66	61	57	53	43	20	13						SM	124.5	1494	7.5	57.7	0.35			
												SP-SM	119.3	1911	5.3	34.7	0.41			
												SP-SM	104.0	1666	6.9	29.9	0.62			
												SP-SM	96.1	1539	15.8	56.5	0.75			
												SW-SM	96.4	1544	16.9	61.0	0.75			
	100	99	97	81	42	30						SM	101.6	1627	11.2	45.8	0.66			
100	96	86	74	21	8	6						SW-SM	120.1	1924	9.9	66.5	0.40			
												SM	116.2	1861	9.7	58.5	0.45			
												SM	119.4	1913	10.8	71.1	0.41			
97	82	64	48	24	13	10						SP-SM								
												SP-SC	124.1	1988	12.7	96.2	0.36			
100	99	98	93	70	34	18			31	21	10	SC	115.4	1849	11.9	69.9	0.46			
												SP-SC								

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ATTERBERG LIMITS (b)		USCS (c)	IN-SITU					COMPACTED			SPECIFIC GRAVITY OF SOLIDS	TRIAXIAL (d)	UNCONFINED COMPRESSION	DIRECT SHEAR	CONSOLIDATION	CHEMICAL	CBR
			DRY UNIT WEIGHT		MOISTURE CONTENT (%)	SATURATION (%)	VOID RATIO	MAXIMUM DRY DENSITY		OPTIMUM MOISTURE (%)							
PL	PI		(pcf)	(kg m^3)				(pcf)	(kg m^3)								
		SP-SM	92.4	1480	9.5	31.1	0.82										
		SM	108.7	1741	4.6	22.6	0.55										
		SM	105.9	1696	8.1	37.2	0.59										
		SM	103.4	1656	6.3	27.0	0.63										
		SM	113.5	1818	10.8	60.1	0.48									*	
		SP-SM	102.3	1639	9.0	37.5	0.65										
		SP-SM	109.1	1748	9.9	49.5	0.54										
62	48	MH	49.4	791	78.4	89.4	2.28				2.60	*					
		ML-MH	70.5	1129	46.7	93.4	1.30					*					
37	13	ML-MH	79.6	1275	32.8	79.3	1.04						*			*	
		ML-MH	97.3	1559	6.0	22.2	0.73										
		ML-MH	77.7	1245	32.4	74.8	1.17										
		SM	87.5	1402	21.8	63.4	0.93										
48	24	MH	65.4	1048	57.1	97.9	1.58							*			
		MH	74.4	1192	49.7	106.1	1.27									*	
35	63	CH	95.6	1371	34.4	94.7	0.97						*				
		CH	70.9	1136	42.0	82.4	1.38										
		ML	59.1	947	16.5	24.0	1.85									*	
		ML	86.6	1387	33.4	95.5	0.95										
	NP	ML	94.4	1512	19.1	65.7	0.79										
		ML	57.9	927	78.2	100.0	1.91									*	
		SP-SM															
		SP-SM															
		SP-SM	115.7	1853	2.8	16.9	0.46									*	
		SP-SM	117.9	1889	10.9	68.6	0.43										
		SM	113.4	1817	5.9	32.8	0.49										
		SP-SM	106.3	1703	4.9	22.8	0.59										
		SP-SM	112.1	1796	4.9	26.6	0.50										
		SP-SM	111.6	1788	6.4	34.2	0.51										
		SM	124.5	1494	7.5	57.7	0.35										
		SP-SM	119.3	1911	5.3	34.7	0.41										
		SP-SM	104.0	1666	6.9	29.9	0.62										
		SP-SM	96.1	1539	15.8	56.5	0.75										
		SW-SM	96.4	1544	16.9	61.0	0.75										
		SM	101.6	1627	11.2	45.8	0.66					*					
		SW-SM	120.1	1924	9.9	66.5	0.40										
		SM	116.2	1861	9.7	58.5	0.45										
		SM	119.4	1913	10.8	71.1	0.41										
		SP-SM															
		SP-SC	124.1	1988	12.7	96.2	0.36										
21	10	SC	115.4	1849	11.9	69.9	0.46										
		SP-SC															

SUMMARY OF LABORATORY TEST RESULTS
VERIFICATION SITE, BIG SMOKY COP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE SAMSO

TABLE 9-1 1 OF 3

FUGRO NATIONAL, INC.

AFV-01

ACTIVITY NUMBER	SAMPLE NUMBER (a)	SAMPLE INTERVAL		PERCENT FINER BY WEIGHT									
				STANDARD SIEVE OPENING							U S STANDARD		
				BLDRS.	COBBLES		GRAVEL				SAND		
		FEET	METERS	24"	12"	8"	3"	1½"	3/4"	3/8"	4	10	40
	D-24	160.0-160.4	48.77-48.89										
BS-B-3	P-1	0.0-1.9	0.00-0.58					100	96	88	81	72	49
	D-3	4.2-4.9	1.28-1.49										
	D-4	7.0-7.5	2.13-2.29					100	89	77	64	51	35
	D-5	10.2-10.9	3.11-3.32					100	84	61	41	27	9
	D-6	15.2-15.7	4.63-4.79										
	D-7	20.0-20.7	6.10-6.31					100	97	92	82	71	34
	D-8	25.0-25.5	7.62-7.77										
	P-9	30.0-31.2	9.14-9.51										
	D-10	35.0-35.6	10.67-10.85										
	D-11	40.0-40.4	12.19-12.31					100	95	69	56	45	21
	D-13	60.0-60.4	18.29-18.41					100	85	74	61	50	20
	D-14	70.2-70.9	21.40-21.61										
	D-15	80.2-80.9	24.44-24.66					100	77	69	57	44	21
	D-16	90.0-90.7	27.43-27.65										
	D-17	100.0-100.5	30.48-30.63										
	D-18	110.0-110.3	33.53-33.62										
	D-19	120.0-120.4	36.58-36.70										
	D-20	140.0-140.7	42.67-42.89										
	D-21	160.2-160.9	48.83-49.04					100	88	77	58	41	21
BS-B-4	P-1	0.0-0.8	0.00-0.24							100	97	91	71
	D-3	3.6-4.2	1.10-1.28					100	89	69	50	35	14
	D-4	7.0-7.6	2.13-2.32										
	D-5	10.0-10.4	3.05-3.17										
	D-6	15.0-15.6	4.57-4.75					100	93	81	61	44	21
	D-7	20.0-20.4	6.10-6.22										
	D-9	30.0-30.3	9.14-9.24										
	D-10	35.0-35.4	10.67-10.79					100	90	63	53	43	31
	D-11	40.0-40.5	12.19-12.34										
	D-12	50.0-50.4	15.25-15.36										
	D-13	60.0-60.4	18.29-18.41					100	82	66	49	39	24
	D-14	70.0-70.4	21.34-21.46										
	D-15	80.0-80.4	24.38-24.51					100	83	67	54	41	24
	D-16	90.0-90.4	27.43-27.55										
	D-17	100.0-100.4	30.48-30.60										
	D-18	110.0-110.7	33.53-33.74										
	D-19	119.0-119.7	36.27-36.48										
	D-20	140.1-140.7	42.70-42.89										
	D-21	160.1-160.6	48.80-48.95					100	93	80	60	43	21
BS-B-5	P-1	0.0-1.3	0.00-0.40										

NOTES:

(a) Sample types
- SS - Standard split spoon
- P - Pitcher
- D - Fugro Drive
- B,b - Bulk

(b) NP - Not Plastic

(c) USCS - Unified Soil Classification System

(d) * Indicates that test has been performed and results are included in this report

CHECKED BY _____ APPROVED BY _____

ER BY WEIGHT							ATTERBERG LIMITS (b)			USCS (c)	IN-SITU					COMPACTED			SPECIFIC GRAVITY OF SOLIDS
U S STANDARD SIEVE NO					PARTICLE SIZE (mm)						DRY UNIT WEIGHT		MOISTURE CONTENT (%)	SATURATION (%)	VOID RATIO	MAXIMUM DRY DENSITY		OPTIMUM MOISTURE (%)	
SAND				SILT OR CLAY															
4	10	40	100	200	.005	.001	LL	PL	PI		(pcf)	(kg/m³)				(pcf)	(kg m³)		
										SC	115.4	1849	13.7	80.1	0.46				
81	72	49	16	7						SP-SM	102.0	1634	4.6	19.2	0.65				
										SM	119.3	1911	8.0	52.3	0.41				
64	51	39	28	24						SM	116.1	1860	8.0	47.7	0.45				
41	27	9	4	3						GW	124.1	1988	8.7	65.3	0.36				
										GW	118.3	1895	10.7	68.4	0.42				
82	71	34	12	9						SW-SM	112.3	1799	9.9	53.4	0.50				
										SW-SM									
										SM	107.7	1725	10.6	50.8	0.56				
										SP-SM	116.8	1871	13.9	84.8	0.44				
56	45	25	9	7						SP-SM	122.1	1956	8.6	61.1	0.38				
61	50	26	15	12			36	19	17	SP-SC	126.2	2022	11.4	91.8	0.34				
										SC	123.8	1983	10.8	81.3	0.36				
57	44	21	14	13			29	22	7	SC	124.6	1996	9.2	70.7	0.35				
										SC	119.7	1917	10.3	68.4	0.41				
										SC	118.9	1905	12.4	80.0	0.42				
										SC	132.3	2119	8.2	80.8	0.27				
										SC	126.4	2025	9.8	79.7	0.33				
										SC	125.8	2015	10.6	84.3	0.34				
58	41	20	15	14						SC	122.7	1965	12.7	91.9	0.37				
97	91	74	42	30						SM	90.6	1451	16.3	51.3	0.86				
50	35	16	4	2						GW	122.7	1965	3.9	28.2	0.37				
										GW	120.6	1932	7.6	51.4	0.40				
										GW	122.8	1967	8.7	62.8	0.37				
61	44	20	12	10						SW-SM	119.3	1911	10.4	67.8	0.41				
										SW-SM	120.3	1927	10.8	72.9	0.40				
										GC									
53	43	33	18	14						GC	121.8	1951	11.3	79.3	0.38				
										GC	110.6	1772	16.9	87.1	0.52				
										GC	115.1	1844	14.8	86.0	0.46				
49	39	25	15	13						GC	125.2	2006	11.6	90.5	0.35				
										GC	115.4	1849	13.2	77.6	0.46				
54	41	23	17	15	11	8	49	20	29	GC	123.3	1975	11.6	85.9	0.37				
										GC									
										GC	119.4	1913	10.5	69.0	0.41				
										GC	121.4	1945	13.9	96.7	0.39				
										GC	114.0	1826	14.9	84.2	0.48				
										GC	121.2	1941	11.8	81.4	0.39				
60	43	23	15	13			43	21	22	SC	122.5	1962	13.3	95.6	0.38				
										SP-SM	100.0	1602	8.1	32.2	0.69				

ERBERG TS (b)		USCS (c)	IN-SITU					COMPACTED			SPECIFIC GRAVITY OF SOLIDS	TRIAXIAL (d)	UNCONFINED COMPRESSION	DIRECT SHEAR	CONSOLIDATION	CHEMICAL	CBR
			DRY UNIT WEIGHT		MOISTURE CONTENT (%)	SATURATION (%)	VOID RATIO	MAXIMUM DRY DENSITY		OPTIMUM MOISTURE (%)							
PL	PI		(pcf)	(kg/m^3)				(pcf)	(kg/m^3)								
		SC	115.4	1849	13.7	80.1	0.46										
		SP-SM	102.0	1634	4.6	19.2	0.65										
		SM	119.3	1911	8.0	52.3	0.41										
		SM	116.1	1860	8.0	47.7	0.45										
		GW	124.1	1988	8.7	65.3	0.36										
		GW	118.3	1895	10.7	68.4	0.42										
		SW-SM	112.3	1799	9.9	53.4	0.50							*			
		SW-SM														*	
		SM	107.7	1725	10.6	50.8	0.56										
		SP-SM	116.8	1871	13.9	84.8	0.44										
		SP-SM	122.1	1956	8.6	61.1	0.38							*			
19	17	SP-SC	126.2	2022	11.4	91.8	0.34										
		SC	123.8	1983	10.8	81.3	0.36										
22	7	SC	124.6	1996	9.2	70.7	0.35									*	
		SC	119.7	1917	10.3	68.4	0.41										
		SC	118.9	1905	12.4	80.0	0.42									*	
		SC	132.3	2119	8.2	80.8	0.27										
		SC	126.4	2025	9.8	79.7	0.33										
		SC	125.8	2015	10.6	84.3	0.34										
		SC	122.7	1965	12.7	91.9	0.37										
		SM	90.6	1451	16.3	51.3	0.86										
		GW	122.7	1965	3.9	28.2	0.37										
		GW	120.6	1932	7.6	51.4	0.40										
		GW	122.8	1967	8.7	62.8	0.37										
		SW-SM	119.3	1911	10.4	67.8	0.41										
		SW-SM	120.3	1927	10.8	72.9	0.40										
		GC															
		GC	121.8	1951	11.3	79.3	0.38										
		GC	110.6	1772	16.9	87.1	0.52										
		GC	115.1	1844	14.8	86.0	0.46										
		GC	125.2	2006	11.6	90.5	0.35									*	
		GC	115.4	1849	13.2	77.6	0.46										
20	29	GC	123.3	1975	11.6	85.9	0.37										
		GC															
		GC	119.4	1913	10.5	69.0	0.41										
		GC	121.4	1945	13.9	96.7	0.39										
		GC	114.0	1826	14.9	84.2	0.48										
		GC	121.2	1941	11.8	81.4	0.39										
21	22	SC	122.5	1962	13.3	35.6	0.38										
		SP-SM	100.0	1602	8.1	32.2	0.69										

SUMMARY OF LABORATORY TEST RESULTS
VERIFICATION SITE, BIG SMOKY COP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE SAMSO

TABLE 9-1 1 OF 1

FUGRO NATIONAL, INC.

AFV-01

ACTIVITY NUMBER	SAMPLE NUMBER (a)	SAMPLE INTERVAL		PERCENT FINER BY WEI								
				STANDARD SIEVE OPENING							U S	
				BLDRS.	COBBLES		GRAVEL					
		FEET	METERS	24"	12"	8"	3"	1½"	3 4"	3 8"	4	1
BS-B-5	SS-2	1.5-2.3	0.46-0.70									
	D-3	3.7-4.4	1.13-1.34						100	99	97	8
	D-4	6.7-7.4	2.04-2.26									
	D-6	15.2-15.9	4.63-4.85									
	D-7	20.2-20.9	6.16-6.37						100	96	86	6
	D-8	25.2-25.9	7.68-7.89									
	D-9	30.2-30.9	9.20-9.42									
	D-10	35.0-35.6	10.67-10.85									
	D-11	40.0-40.4	12.19-12.31									
	D-12	50.0-50.7	15.24-15.45									
	P-13	60.0-61.6	18.29-18.78							100	99	9
	P-14	68.0-68.7	20.73-20.94									
	P-15	80.0-81.1	24.38-24.72									
	P-16	90.0-92.7	27.43-28.25							100	97	8
	P-17	99.0-101.8	30.18-31.03									
	P-18	110.0-110.8	33.53-33.77							100	99	9
	P-19	120.0-122.7	36.58-37.40									
	P-20	140.0-141.6	42.67-43.16						100	95	93	
	D-21	160.2-160.9	48.83-49.04									
BS-B-6	P-1	0.0-1.3	0.00-0.40									
	D-3	3.3-4.0	1.01-1.22						100	89	78	
	P-4	6.5-8.1	1.98-2.47						100	87	79	
	D-5	10.7-11.4	3.26-3.47									
	D-6	15.2-15.9	4.63-4.85									
	D-7	20.0-20.5	6.10-6.25						100	82	67	
	D-8	25.7-26.4	7.83-8.05									
	D-9	30.2-30.9	9.20-9.42									
	D-10	35.0-35.6	10.67-10.85									
	D-11	40.0-40.6	12.19-12.37						100	80	60	
	D-12	50.2-50.9	15.30-15.51									
	D-13	60.0-60.7	18.29-18.50									
	D-14	70.2-70.7	21.40-21.55						100	99	89	
	D-15	80.4-80.9	24.51-24.66									
	D-16	90.4-90.9	27.55-27.71									
	D-17	100.1-100.6	30.51-30.66									
	D-18	110.0-110.4	33.53-33.65					100	95	81	71	
	D-19	120.4-120.9	36.70-36.85									
	D-20	140.2-140.7	42.73-42.89									
	D-21	160.0-160.5	48.77-48.92						100	86	73	
BS-T-1	B-1	0.5-2.0	0.15-0.61					100	87	76	63	

NOTES:

(a) Sample types
- SS - Standard split spoon
- P - Pitcher
- D - Fugro Drive
- B,b - Bulk

(b) NP - Not Plastic

(c) USCS - Unified Soil Classification System

(d) * Indicates that test has been performed and results are included in this report

CHECKED BY _____ APPROVED BY _____

PERCENT FINER BY WEIGHT									ATTERBERG LIMITS (b)			USCS (c)	IN-SITU					COMPACTED		
DING		U S STANDARD SIEVE NO					PARTICLE SIZE (mm)						DRY UNIT WEIGHT		MOISTURE CONTENT (%)	SATURATION (%)	VOID RATIO	MAXIMUM DRY DENSITY		OPTIMUM
AVEL		SAND				SILT OR CLAY														
3/4"	3/8"	4	10	40	100	200	.005	.001	LL	PL	PI		(pcf)	(kg/m³)				(pcf)	(kg/m³)	
												SP-SM								
100	99	97	86	50	7	3						SP	109.0	1746	3.0	15.1	0.55			
												SP-SM	111.5	1786	4.8	25.5	0.51			
												SP-SM								
100	96	86	69	39	11	5						SP-SM	115.0	1842	7.1	41.3	0.47			
												SP-SM	107.9	1728	5.3	25.6	0.56			
												SP-SM	115.9	1857	10.3	61.5	0.45			
												SP-SM	105.3	1687	15.7	70.6	0.60			
												SP-SM	113.1	1812	10.6	58.4	0.49			
												SP-SM	114.7	1837	11.0	63.6	0.47			
	100	99	98	91	39	18						SM	100.5	1610	23.6	94.3	0.68			
												SM	85.1	1363	22.9	63.0	0.98			
												SP	93.9	1504	18.2	62.0	0.79			
	100	97	86	55	13	1						SP	98.8	1583	23.3	89.2	0.71			
												SM	84.9	1360	32.6	89.4	0.99			
	100	99	92	74	55	39						SM	81.8	1310	34.5	87.9	1.06			
												SM	90.7	1453	28.5	89.7	0.86			
100	95	93	89	32	12	5						SW-SM	97.2	1557	23.9	88.0	0.73			
												SW-SM	115.6	1852	13.6	80.3	0.46			
												SP-SM	97.5	1562	5.7	21.1	0.73			
100	89	78	63	44	23	12						SP-SM	109.0	1746	3.2	16.1	0.55			
100	87	79	72	58	36	21						SM	104.6	1676	4.7	20.6	0.61			
												SP-SM	109.3	1751	9.4	47.1	0.54			
												SP-SM	117.8	1887	8.3	52.0	0.43			
100	82	67	50	23	13	9						SW-SM	123.8	1983	9.8	73.5	0.36			
												SM	115.0	1842	6.8	39.1	0.47			
												SM	123.8	1983	8.3	62.0	0.36			
												SM	128.2	2054	8.6	73.6	0.31			
100	80	60	43	30	23	18						SM	126.3	2023	8.7	70.1	0.33			
												SP-SM	115.5	1850	6.9	40.8	0.46			
												SP-SM	121.0	1938	10.3	71.1	0.39			
100	99	89	72	41	16	7						SP-SM	117.4	1881	6.3	39.4	0.44			
												SP-SM	124.7	1998	7.5	57.5	0.35			
												SM	119.4	1913	10.0	65.5	0.41			
												SM	123.1	1972	7.2	53.0	0.37			
95	81	71	59	30	19	14						SM	127.1	2036	9.3	77.3	0.33			
												SM	120.7	1934	6.4	43.6	0.40			
												SM	134.0	2146	5.3	55.5	0.26			
100	86	73	61	41	29	22						SM								
87	76	63	49	21	12	7						SP-SM								

System

formed

report

PG (b) PI	USCS (c)	IN-SITU Dry UNIT WEIGHT (pcf)	IN-SITU Dry UNIT WEIGHT (kg/m³)	IN-SITU MOISTURE CONTENT (%)	IN-SITU SATURATION (%)	IN-SITU VOID RATIO	COMPACTED MAXIMUM DRY DENSITY (pcf)	COMPACTED MAXIMUM DRY DENSITY (kg m³)	COMPACTED OPTIMUM MOISTURE (%)	SPECIFIC GRAVITY OF SOLIDS	TRIAXIAL (d)	UNCONFINED COMPRESSION	DIRECT SHEAR	CONSOLIDATION	CHEMICAL	CBR
	SP-SM														*	
	SP	109.0	1746	3.0	15.1	0.55										
	SP-SM	111.5	1786	4.8	25.5	0.51										
	SP-SM															
	SP-SM	115.0	1842	7.1	41.3	0.47							*			
	SP-SM	107.9	1728	5.3	25.6	0.56										
	SP-SM	115.9	1857	10.3	61.5	0.45										
	SP-SM	105.3	1687	15.7	70.6	0.60										
	SP-SM	113.1	1812	10.6	58.4	0.49										
	SP-SM	114.7	1837	11.0	63.6	0.47										
	SM	100.5	1610	23.6	94.3	0.68										
	SM	85.1	1363	22.9	63.0	0.98										
	SP	93.9	1504	18.2	62.0	0.79										
	SP	98.8	1583	23.3	89.2	0.71										
	SM	84.9	1360	32.6	89.4	0.99										
	SM	81.8	1310	34.5	87.9	1.06						*				
	SM	90.7	1453	28.5	89.7	0.86										
	SW-SM	97.2	1557	23.9	88.0	0.73										
	SW-SM	115.6	1852	13.6	80.3	0.46										
	SP-SM	97.5	1562	5.7	21.1	0.73										
	SP-SM	109.0	1746	3.2	16.1	0.55										
	SM	104.6	1676	4.7	20.6	0.61							*			
	SP-SM	109.3	1751	9.4	47.1	0.54										
	SP-SM	117.8	1887	8.3	52.0	0.43										
	SW-SM	123.8	1983	9.8	73.5	0.36										
	SM	115.0	1842	6.8	39.1	0.47										
	SM	123.8	1983	8.3	62.0	0.36										
	SM	128.2	2054	8.6	73.6	0.31										
	SM	126.3	2023	8.7	70.1	0.33										
	SP-SM	115.5	1850	6.9	40.8	0.46										
	SP-SM	121.0	1938	10.3	71.1	0.39										
	SP-SM	117.4	1881	6.3	39.4	0.44										
	SP-SM	124.7	1998	7.5	57.5	0.35										
	SM	119.4	1913	10.0	65.5	0.41										
	SM	123.1	1972	7.2	53.0	0.37										
	SM	127.1	2036	9.3	77.3	0.33										
	SM	120.7	1934	6.4	43.6	0.40										
	SM	134.0	2146	5.3	55.5	0.26										
	SM															
	SP-SM															

SUMMARY OF LABORATORY TEST RESULTS
VERIFICATION SITE, BIG SMOKY COR, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE · SAMSO

TABLE 9-1
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FUGRO NATIONAL, INC.

AFV-01

0.5-2.0	0.15-0.61
0.5-2.0	0.15-0.61
0.25-1.5	0.08-0.46
0.5-2.0	0.15-0.61
0.5-2.0	0.15-0.61
0.25-1.5	0.08-0.46
0.5-2.0	0.15-0.61
0.5-2.0	0.15-0.61
0.5-2.0	0.15-0.61
0.5-2.0	0.15-0.61
0.5-2.0	0.15-0.61
0.5-2.0	0.15-0.61

PERCENT FINER BY WEIGHT										ATTERBERG LIMITS (b)			USCS (c)	IN-SITU					COMPACTED		
...NING			U S STANDARD SIEVE NO					PARTICLE SIZE (mm)						DRY UNIT WEIGHT		MOISTURE CONTENT (%)	SATURATION (%)	VOID RATIO	MAXIMUM DRY DENSITY		
...AVEL			SAND				SILT OR CLAY														
"	3/4"	3/8"	4	10	40	100	200	.005	.001	LL	PL	PI		(pcf)	(kg/m³)				(pcf)	(kg/m³)	OPTIMUM
	95	94	92	87	75	19	5						SP-SM								
		100	97	94	74	39	25						SM								
													SP								
	86	76	67	59	41	10	6						SP-SM								
	88	82	72	63	48	28	17	5	3			NP	SM						119.2	1909	
	91	78	67	53	29	16	11					NP	SW-SM						130.5	2090	
	100	96	89	82	65	37	19					NP	SM								
	99	94	89	82	68	19	6						SP-SM								
			100	98	80	16	3						SP								
	99	96	92	85	62	36	18						SM								
	98	88	78	65	52	40	33	23	13	40	24	16	SC								
	95	89	85	79	65	26	16						SM								
		100	95	84	59	33	23	6	3			NP	SM								
		100	95	86	52	31	18						SM								
	89	65	37	25	17	8	5						GP-GM								
	100	97	87	64	21	8	4						SP								
	98	93	82	64	38	19	12					NP	SM								
	100	94	79	63	37	16	8						SP-SM								
	99	97	83	83	52	30	19						SM						123.3	1975	
		100	96	84	36	12	7						SW-SM						120.0	1922	
	100	95	79	60	34	20	14			23	21	2	SM								
	100	98	90	72	35	16	11						SW-SM								
	97	92	84	73	43	23	15						SM						130.2	2086	
	100	95	86	76	52	26	15					NP	SM								

...n System

...rformed
...s report

ERG (b)		USCS (c)	IN-SITU					COMPACTED			SPECIFIC GRAVITY OF SOLIDS	TRIAXIAL (d)	UNCONFINED COMPRESSION	DIRECT SHEAR	CONSOLIDATION	CHEMICAL	CBR
	PI		DRY UNIT WEIGHT (pcf)	DRY UNIT WEIGHT (kg/m^3)	MOISTURE CONTENT (%)	SATURATION (%)	VOID RATIO	MAXIMUM DRY DENSITY (pcf)	MAXIMUM DRY DENSITY (kg/m^3)	OPTIMUM MOISTURE (%)							
		SP-SM															
		SM															
		SP														*	
		SP-SM															
	NP	SM						119.2	1909	13.2	2.68						*
	NP	SW-SM						130.5	2090	8.8	2.69						*
	NP	SM									2.56						
		SP-SM															
		SP															
		SM															
24	16	SC															
		SM															
	NP	SM															
		SM															
		GP-GM															
		SP															
	NP	SM															
		SP-SM															
		SM						123.3	1975	10.5							*
		SW-SM						120.0	1922	11.5							*
21	2	SM															
		SW-SM															
		SM						130.2	2086	8.5							*
	NP	SM															

SUMMARY OF LABORATORY TEST RESULTS
VERIFICATION SITE, BIG SMOKY CDP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

TABLE 9-1 1 OF 3

FUGRO NATIONAL, INC.

AFV-01

ACTIVITY NUMBER	SAMPLE NUMBER (a)	SAMPLE INTERVAL		PERCENT FINER BY WE							
				STANDARD SIEVE OPENING							U S
				BLDRS.	COBBLES		GRAVEL				
		FEET	METERS	24"	12"	8"	3"	1½"	3/4"	3/8"	4
BS-F-5	B-1	1.0-1.3	0.30-0.40					100	96	94	91
	B-2	1.7-2.0	0.52-0.61							100	97
BS-F-6	B-1	1.0-1.3	0.30-0.40						100	99	94
	B-2	2.0-2.8	0.61-0.85					100	99	96	85
BS-F-7	B-1	1.2-1.5	0.35-0.46						100	96	91
	B-2	2.2-2.5	0.67-0.76						100	96	88
BS-F-8	B-1	0.5-1.0	0.15-0.30					100	99	96	93
	B-2	1.5-1.8	0.46-0.55						100	93	78
BS-F-9	B-1	0.7-1.3	0.21-0.40					100	78	62	48
	B-2	1.7-2.0	0.52-0.61					100	80	62	50
BS-F-10	B-1	1.0-1.3	0.30-0.40						100	94	84
	B-2	1.8-2.2	0.55-0.67					100	95	77	62
BS-F-11	B-1	0.5-1.0	0.15-0.30						100	99	97
	B-2	1.5-1.8	0.46-0.55					100	99	98	98
BS-F-12	B-1	1.0-1.5	0.30-0.46							100	93
	B-2	1.8-2.2	0.55-0.67					100	96	91	85
BS-F-13	B-1	0.5-1.0	0.15-0.30						100	99	96
	B-2	2.0-2.3	0.61-0.70						100	92	90
BS-F-14	B-1	1.0-1.3	0.30-0.40							100	98
	B-2	2.0-2.3	0.61-0.70					100	97	90	87
BS-F-15	B-1	1.0-1.3	0.30-0.40					100	96	89	76
	B-2	1.7-2.0	0.52-0.61					100	97	89	78
BS-F-16	B-1	1.0-1.2	0.30-0.37							100	99
BS-F-17	B-1	0.5-0.8	0.15-0.24						100	87	77
	B-2	1.5-1.8	0.46-0.55						100	90	80
BS-F-18	B-1	1.0-1.3	0.30-0.40							100	98
	B-2	1.7-2.0	0.52-0.61						100	99	98
BS-F-19	B-1	1.3-2.0	0.40-0.61							100	97

NOTES:

(a) Sample types
- SS - Standard split spoon
- P - Pitcher
- D - Fugro Drive
- B,b - Bulk

(b) NP - Not Plastic

(c) USCS - Unified Soil Classification System

(d) * Indicates that test has been performed and results are included in this report

CHECKED BY _____ APPROVED BY _____

FINER BY WEIGHT								ATTERBERG LIMITS (b)			USCS (c)	IN-SITU					COMPACTED			
U S STANDARD SIEVE NO						PARTICLE SIZE (mm)						DRY UNIT WEIGHT		MOISTURE CONTENT (%)	SATURATION (%)	VOID RATIO	MAXIMUM DRY DENSITY		OPTIMUM MOISTURE (%)	SPECIFIC
SAND					SILT OR CLAY															
3/8"	4	10	40	100	200	.005	.001	LL	PL	PI		(pcf)	(kg/m³)				(pcf)	(kg m⁻³)		
94	91	88	70	26	12						SP-SM									
100	97	94	76	35	15						SM						114.0	1826	10.6	
99	94	89	70	31	17						SM									
96	85	76	54	15	7						SW-SM									
96	91	84	63	25	14						SM									
96	88	80	60	23	11						SW-SM									
96	93	86	71	44	34			22	19	3	SM						128.0	2050	9.5	
93	78	62	32	12	9					NP	SP-SM									
62	48	35	13	5	4					NP	GP									
62	50	39	17	3	2						GP									
94	84	75	54	26	17						SM									
77	62	50	27	4	3						SP									
99	97	91	83	55	38			25	19	6	SM-SC						118.5	1898	14.1	
98	98	96	94	84	73			22	21	1	ML						114.5	1834	14.7	
100	93	81	62	38	28			21	18	3	SM									
91	85	77	54	16	11						SW-SM									
99	96	85	54	25	12						SP-SM									
92	90	87	81	56	33						CM									
100	98	95	81	38	16						SM									
90	87	81	63	31	19					NP	SM									
89	76	60	36	20	11						SP-SM									
89	78	57	32	14	6						SP-SM									
100	99	91	56	33	23						SM									
87	77	69	56	42	32			33	22	11	SC						128.3	2055	10.6	
90	80	65	31	16	9						SW-SM						133.4	2137	8.3	
100	98	94	84	51	27						SM						120.5	1930	10.5	
99	98	92	69	43	30						S'									
100	97	92	67	35	16						SM									

PI	USCS (c)	IN-SITU					COMPACTED			SPECIFIC GRAVITY OF SOLIDS	TRIAXIAL (d)	UNCONFINED COMPRESSION	DIRECT SHEAR	CONSOLIDATION	CHEMICAL	CBR
		DRY UNIT WEIGHT (pcf)	DRY UNIT WEIGHT (kg m^3)	MOISTURE CONTENT (%)	SATURATION (%)	VOID RATIO	MAXIMUM DRY DENSITY (pcf)	MAXIMUM DRY DENSITY (kg m^3)	OPTIMUM MOISTURE (%)							
	SP-SM															
	SM						114.0	1826	10.6							*
	SM															
	SW-SM															
	SM															
	SW-SM															
3	SM						128.0	2050	9.5							*
NP	SP-SM															
NP	GP															*
	GP															*
	SM															
	SP															
6	SM-SC						118.5	1898	14.1							*
1	ML						114.5	1834	14.7							*
3	SM															
	SW-SM															
	SP-SM															
	SM															
	SM															
NP	SM															
	SP-SM															
	SP-SM															
	SM															
11	SC						128.3	2055	10.6							*
	SW-SM						133.4	2137	8.3							*
	SM						120.5	1930	10.5							*
	SM															
	SM															

SUMMARY OF LABORATORY TEST RESULTS
VERIFICATION SITE, BIG SMOKY COP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE SAMSO

TABLE 9-1 5 OF 5

FUGRO NATIONAL, INC.

AFV-01

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FN-TR-27-V111

BORING NO.	SAMPLE NO.	SAMPLE INTERVAL		SOIL TYPE	TYPE OF TEST	DRY DENSITY		MOISTURE CONTENT (%)	CONFINING PRESSURE (σ_3)		MAXIMUM DEVIATOR STRESS ($\sigma_1-\sigma_3$)		STRAIN RATE (%/min)	BACK PRESSURE	
		FEET	METERS			pcf	kg/m³		ksf	kN/m²	ksf	kN/m²		ksf	kN/m²
BS-B-1	P-9	30.0-30.9	9.14-9.42	MH	CU	49.4	791	78.4	3.0	144	17.4	833	0.004	14.4	689
	P-9	30.9-31.8	9.42-9.69	MH	CU	58.8	942	64.1	6.0	287	12.2	584	0.004	15.1	723
	P-10	35.8-36.4	10.91-11.09	ML-MH	CU	70.5	1129	46.7	9.0	431	26.0	1245	0.004	14.4	689
BS-B-2	P-16	61.4-62.2	18.71-18.96	SM	CD	101.6	1627	11.2	6.0	287	18.4	881	0.004	0	0
	P-16	62.2-63.0	18.96-19.20	SM	CD	106.9	1712	7.3	10.0	479	30.6	1465	0.004	0	0

SUMMARY OF TRIAXIAL COMPRESSION TEST RESULTS
VERIFICATION SITE, BIG SMOKY COP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

TABLE 9-2

WOODWARD-CLYDE CONSULTANTS

AFV-10

BORING NO.	SAMPLE NO.	SAMPLE INTERVAL FEET	SAMPLE INTERVAL METERS	SOIL TYPE	UNCONFINED COMP. STRENGTH ksf	UNCONFINED COMP. STRENGTH kN/m²	DRY DENSITY pcf	DRY DENSITY kg/m³	MOISTURE CONTENT (%)	DEGREE OF SATURATION (%)	HEIGHT/ DIAMETER
BS-B-1	P-11	40.0-40.7	12.19-12.41	ML-MH	11.3	541	79.6	1275	32.8	79.3	2.0
	P-17	90.8-91.5	27.68-27.88	CH	11.6	555	85.6	1371	34.4	94.7	2.4
BS-B-5	P-10	110.0-110.8	33.53-33.77	SM	7.7	369	81.8	1310	34.5	87.8	2.4

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SUMMARY OF UNCONFINED COMPRESSION TEST RESULTS
VERIFICATION SITE, BIG SMOKY COP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

TABLE 9-3

WOODWARD-CLYDE CONSULTANTS

FN-TR-27-VIII

BORING NO.	SAMPLE NO.	SAMPLE INTERVAL		SOIL TYPE	NORMAL STRESS		MAXIMUM SHEAR STRENGTH	
		FEET	METERS		ksf	kN/m^2	ksf	kN/m^2
BS-B-1	P-15	70.8-71.6	21.58-21.82	MH	7.0	335	9.8	469
					9.0	431	12.4	594
BS-B-3	D-7	20.0-20.7	6.10-6.31	SW-SM	2.0	96	2.4	115
					4.0	192	4.0	192
					6.0	287	5.4	259
BS-B-3	D-11	40.0-40.4	12.19-12.31	SP-SM	4.0	192	5.0	239
					8.0	383	8.9	426
					12.0	575	11.9	570
BS-B-5	D-7	20.2-20.9	6.16-6.37	SP-SM	2.0	96	2.2	105
					4.0	192	4.6	220
					6.0	287	5.8	278
BS-B-6	P-4	6.5-7.3	1.98-2.23	SM	1.0	48	1.6	77
					2.0	96	2.9	139
					3.0	144	3.4	163

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SUMMARY OF DIRECT SHEAR TEST RESULTS
VERIFICATION SITE, BIG SMOKY CDP, NEVADA

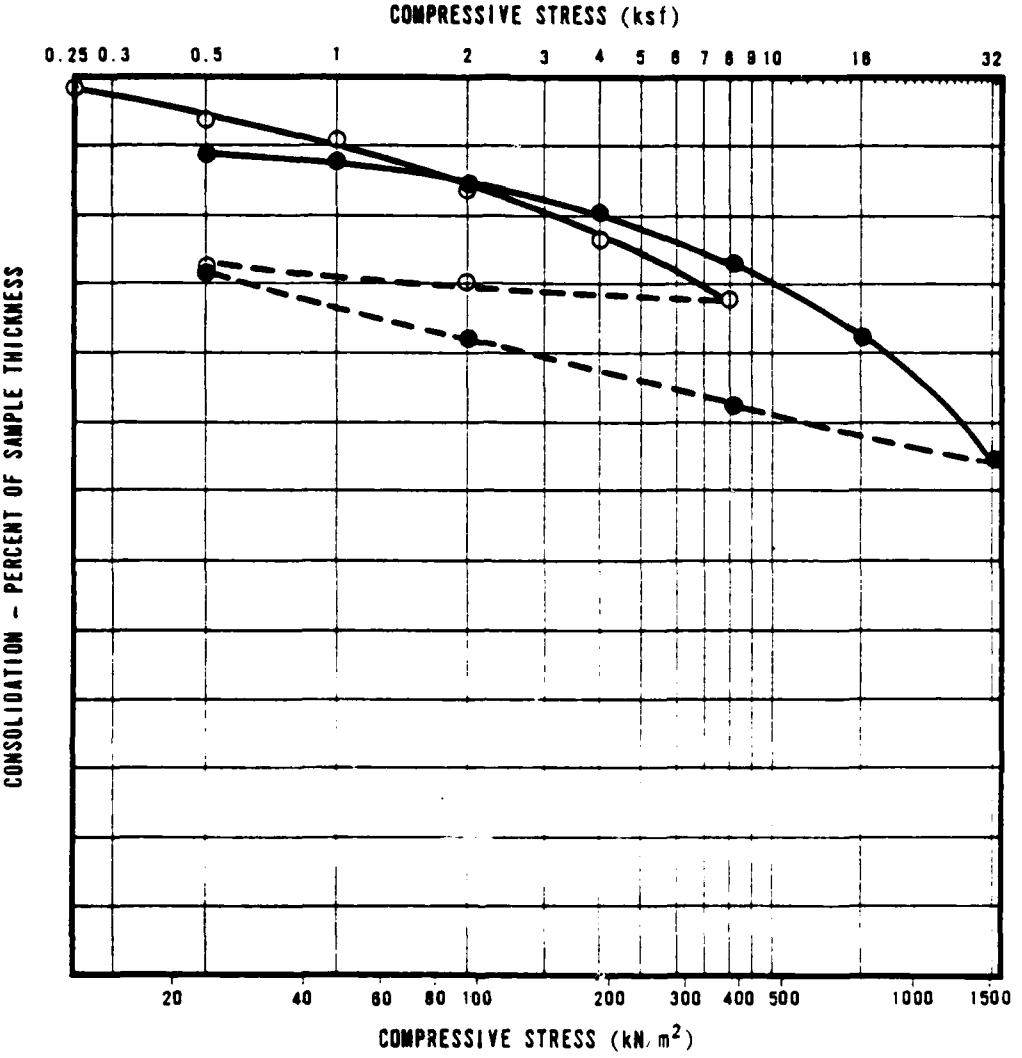
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

TABLE 9-4

FUGRO NATIONAL, INC.

2 JUL 79

AFV-11



SYMBOL	BORING NO.	SAMPLE NO.	SAMPLE INTERVAL		SOIL TYPE	INITIAL DRY DENSITY		INITIAL MOISTURE CONTENT (%)	INITIAL VOID RATIO	INITIAL DEGREE OF SATURATION (%)
			FEET	METERS		pcf	kg/m³			
○	BS-8-1	P-9	30.0-31.8	9.14-9.69	MH	52.4	839	75.4	2.10	93.4

○ AT FIELD MOISTURE
● AFTER ADDITION OF WATER
——— COMPRESSION
– – – REBOUND

CONSOLIDATION TEST RESULTS
VERIFICATION SITE, BIG SMOKY CDP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 9-1

UGRO NATIONAL, INC.

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AFV-02

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2 JUL 79

FN-TR-27-VIII

ACTIVITY NO.	SAMPLE NO.	SAMPLE INTERVAL		SOIL TYPE	pH	WATER SOLUBLE				CALCIUM CARBONATE
		FEET	METERS			SODIUM	CHLORIDE	SULPHATE	CALCIUM	
						mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
BS-B-1	D-6	15.0-15.6	4.57-4.75	SM	5.8	84	85	32	73	274
	P-11	40.0-40.7	12.19-12.41	ML-MH	6.9	97	48	21	21	175
	P-16	80.0-81.1	24.38-24.72	MH	7.0	142	39	18	57	208
	P-19	110.0-111.8	33.53-34.08	ML	7.0	84	54	46	19	205
	P-22	160.0-162.3	48.77-49.47	ML	7.5	372	28	22	22	110
BS-B-2	D-4	3.7-4.4	1.13-1.34	SP-SM	7.5	76	36	54	41	186
BS-B-3	D-8	25.0-25.5	7.62-7.77	SW-SM	7.0	82	144	109	63	291
	D-15	80.2-80.9	24.44-24.66	SC	6.8	55	41	72	61	247
	D-17	100.0-100.5	30.48-30.63	SC	6.8	57	43	<1	65	266
BS-B-4	D-13	60.0-60.4	18.29-18.41	GC	6.8	57	24	9	46	230
BS-B-5	SS-2	2.0-3.0	0.61-0.91	SP-SM	7.2	52	49	13	59	147
BS-T-3	b-4	5.0-5.5	1.52-1.68	SP	7.5	251	67	70	33	144

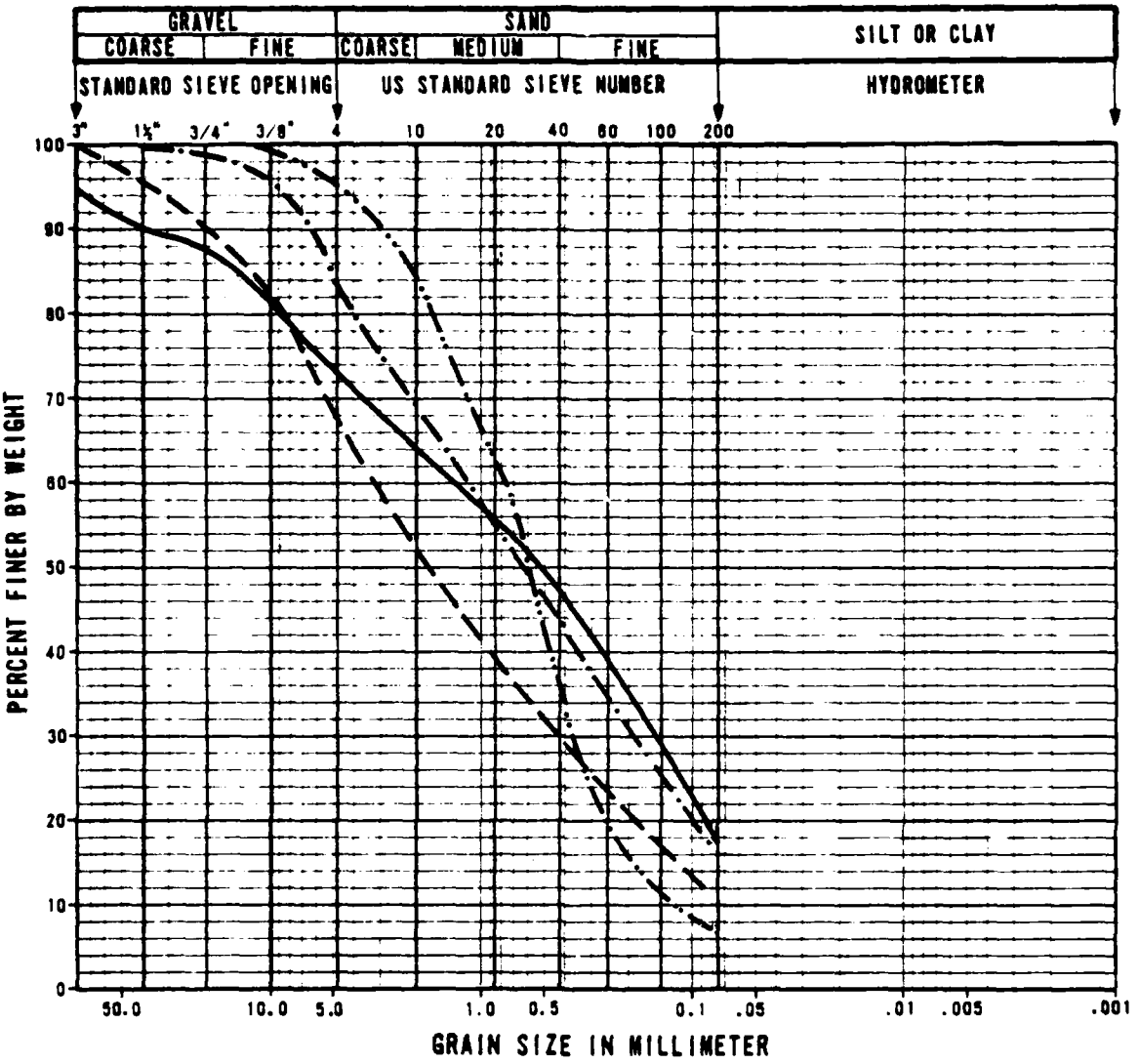
SUMMARY OF CHEMICAL TEST RESULTS
VERIFICATION SITE, BIG SMOKY CDP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

TABLE 9-5

FUGRO NATIONAL, INC.

AFV-07



SYMBOL	COMPOSITE SAMPLE NUMBER	ACTIVITY NUMBER	SAMPLE INTERVAL		SOIL TYPE
			FEET	METERS	
——	A	BS-T-5	0.5-2.0	0.15-0.61	SM
— —	B	BS-T-6	0.5-2.0	0.15-0.61	SW-SM
—·—	C	BS-F-2	1.0-1.3	0.30-0.40	SM
—··—	D	BS-F-2	2.0-2.3	0.61-0.70	SW-SM

GRAIN SIZE CURVES, CBR TESTS
VERIFICATION SITE, BIG SMOKY CDP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 9-2
1 OF 4

FUGRO NATIONAL, INC.

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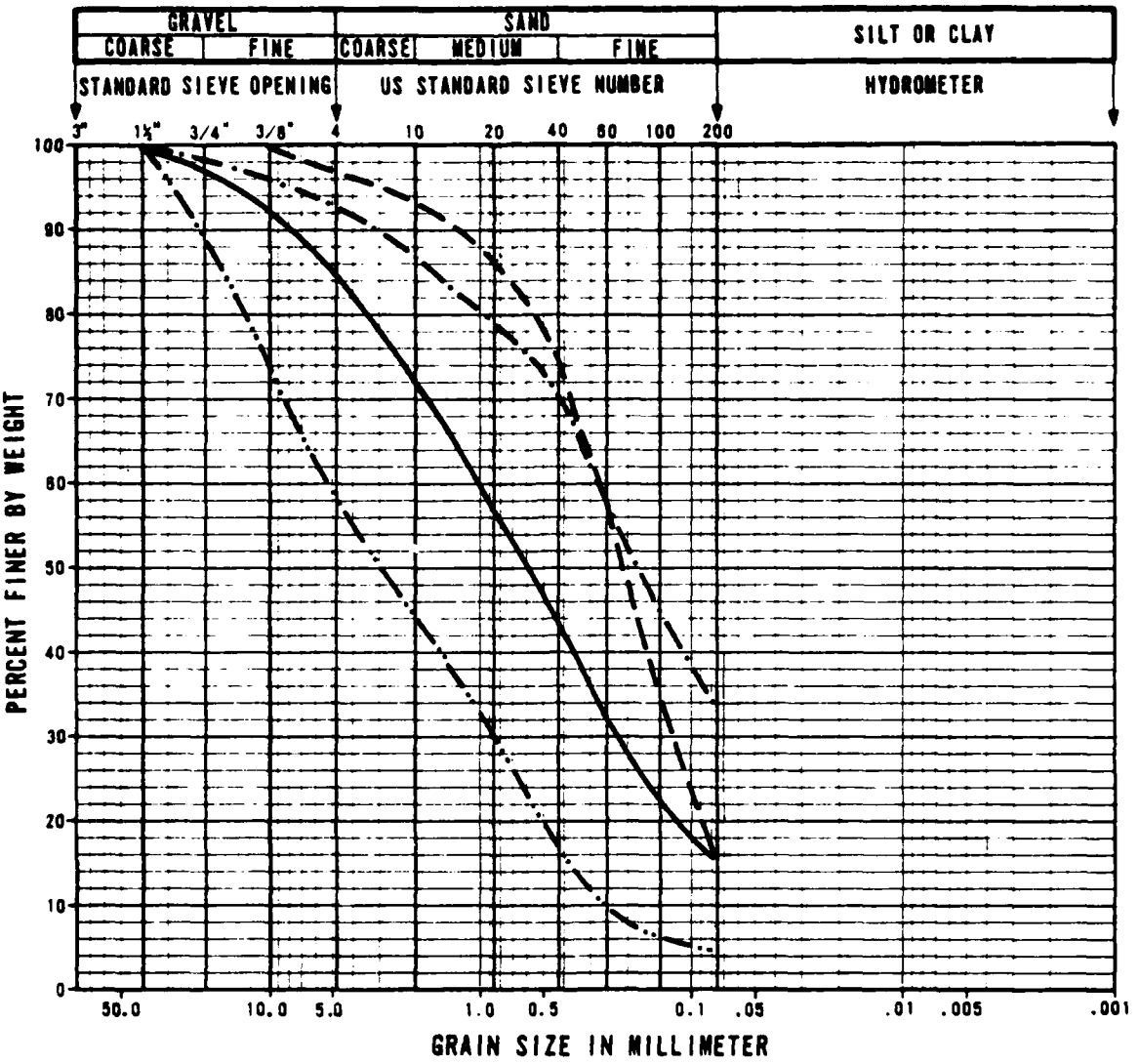
AFV-12



SYMBOL	COMPOSITE SAMPLE NUMBER	ACTIVITY NUMBER	SAMPLE INTERVAL		SOIL TYPE
			FEET	METERS	
———	E	BS-F-4	1.0-1.3	0.30-0.40	SM
— — —	F	BS-F-5	1.7-2.0	0.52-0.61	SM
— · —	G	BS-F-8	0.5-1.0	0.15-0.30	SM
— ·· —	H	BS-F-9	0.7-1.3 1.7-2.0	0.21-0.40 0.52-0.61	SP-SM

GRAIN SIZE CURVES, CBR TESTS
VERIFICATION SITE, BIG SMOKY COP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 9-2
2 OF 4

FUGRO NATIONAL, INC.

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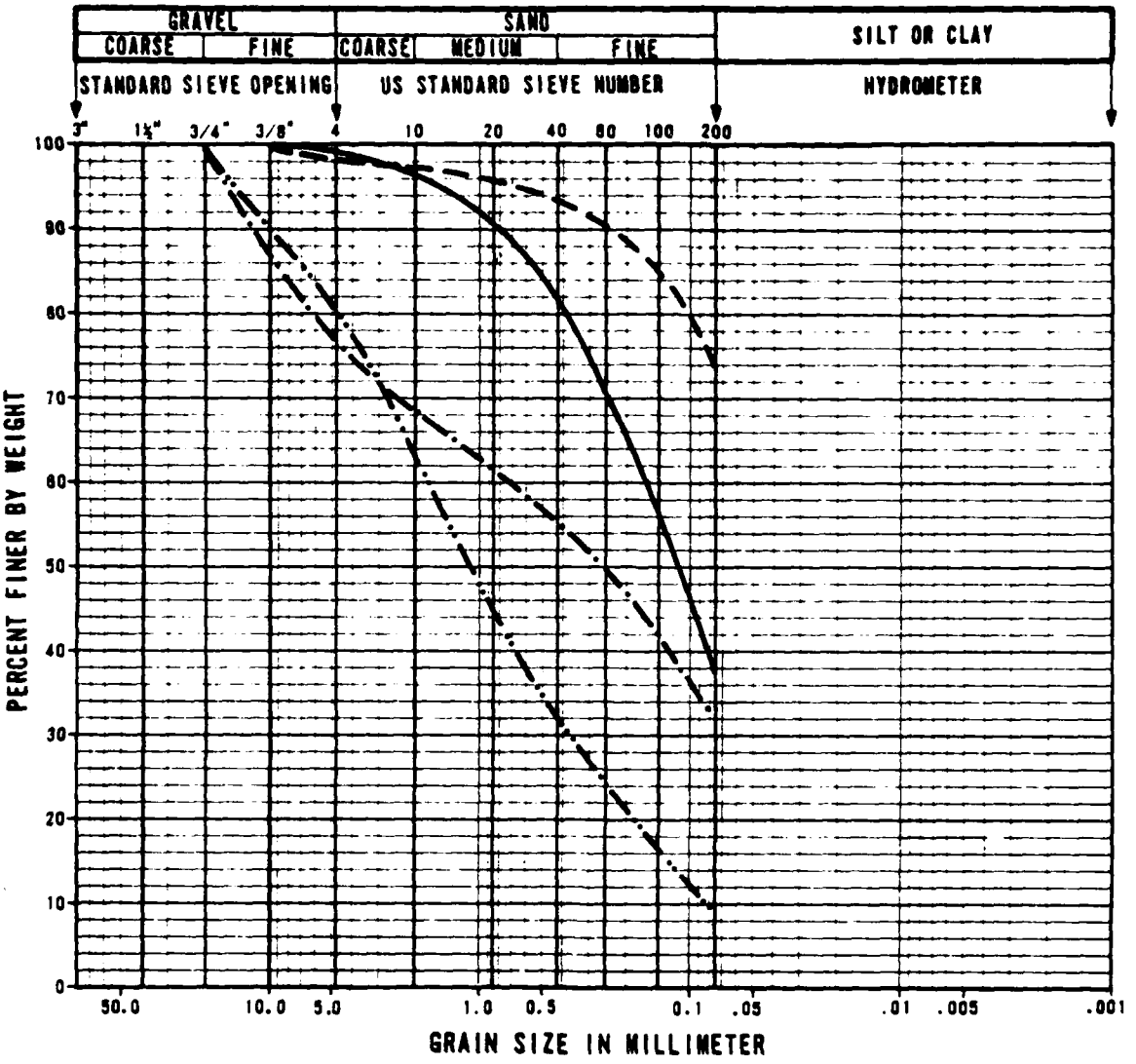
2 JUL 79

AFV-12



SYMBOL	COMPOSITE SAMPLE NUMBER	ACTIVITY NUMBER	SAMPLE INTERVAL		SOIL TYPE
			FEET	METERS	
———	I	BS-F-11	0.5-1.0	0.15-0.30	SM-SC
— — —	J	BS-F-11	1.5-1.8	0.46-0.55	ML
—·—	K	BS-F-17	0.5-0.8	0.15-0.24	SC
—··—	L	BS-F-17	1.5-1.8	0.46-0.55	SW-SM

GRAIN SIZE CURVES, CBR TESTS
VERIFICATION SITE, BIG SMOKY CDP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 9-2
3 OF 4

FUGRO NATIONAL, INC.

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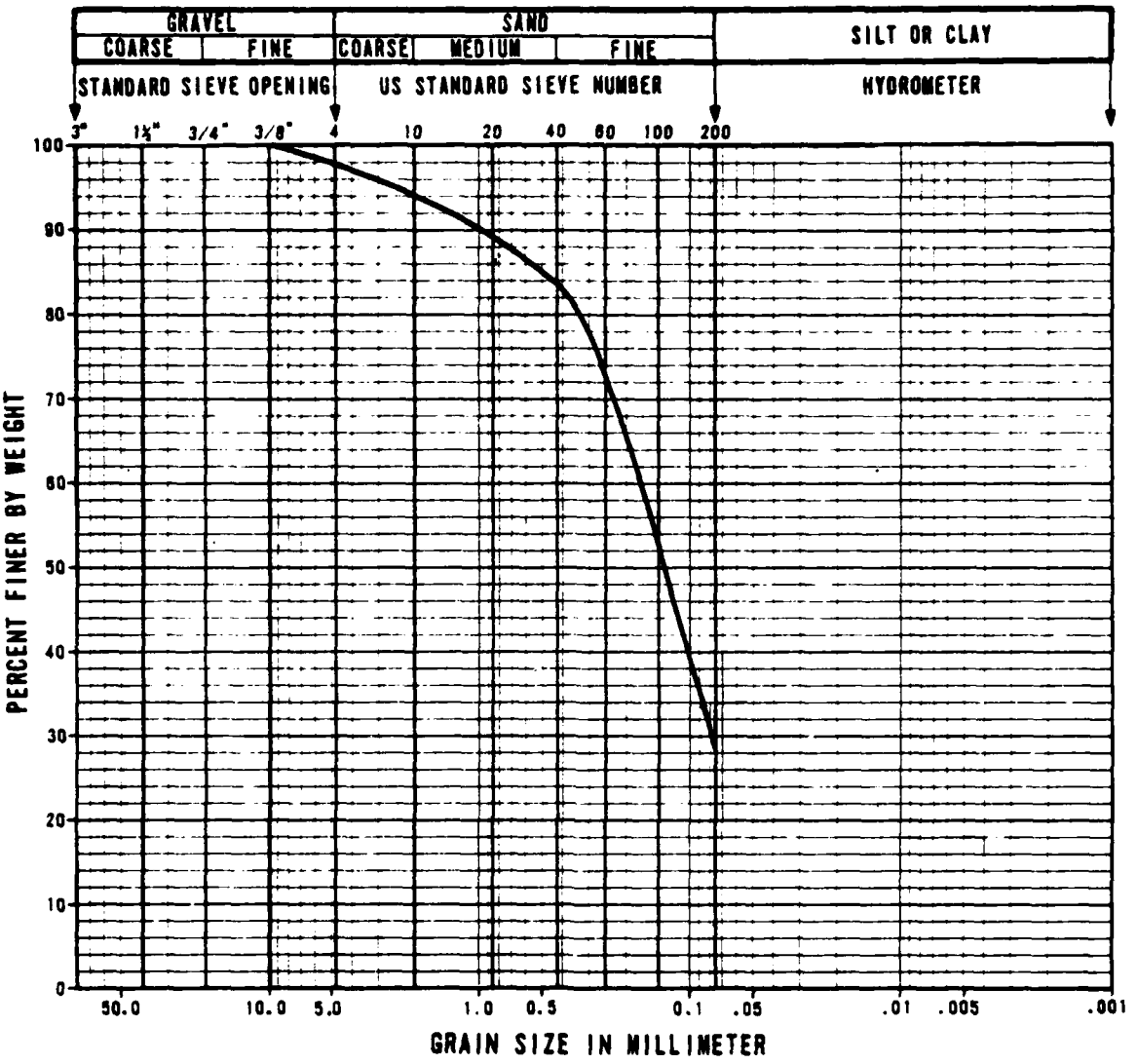
2 JUL 79

AFV-12



SYMBOL	COMPOSITE SAMPLE NUMBER	ACTIVITY NUMBER	SAMPLE INTERVAL		SOIL TYPE
			FEET	METERS	
———	M	BS-F-18	1.0-1.3	0.30-0.40	SM

GRAIN SIZE CURVES, CBR TESTS
VERIFICATION SITE, BIG SMOKY CDP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 9-2
4 OF 4

FUGRO NATIONAL, INC.

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2 JUL 78

AFV-12

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2 JUL 79

FM- TR-27-VIII

COMPOSITE SAMPLE NUMBER	SOIL TYPE	PERCENT PASSING #200	ATTERBERG LIMITS		SPECIFIC GRAVITY	MAXIMUM DRY DENSITY		OPTIMUM MOISTURE (%)	COMPACTED DRY DENSITY		COMPACTED MOISTURE (%)	PERCENT OF MAXIMUM DRY DENSITY	CBR (%)
			LL	PI		pcf	kg/m³		pcf	kg/m³			
A	SM	17		NP	2.68	119.2	1909	13.2	107.3	1719	13.7	90.0	33
									103.1	1652	12.4	86.5	10
B	SW-SM	11		NP	2.69	130.5	2090	9.8	124.1	1988	8.7	95.1	58
									118.8	1905	8.9	91.1	23
									115.9	1857	9.0	88.8	14
C	SM	16				123.3	1975	10.5	119.2	1909	10.0	96.7	77
									115.1	1844	10.0	93.4	30
D	SW-SM	7				120.0	1922	11.5	114.7	1837	11.3	95.6	42
									111.9	1792	11.2	93.2	31
									107.5	1722	11.3	89.6	19

CALIFORNIA BEARING RATIO (CBR) TEST RESULTS
VERIFICATION SITE, BIG SMOKY COP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

TABLE 9-6 1 OF 4

FUGRO NATIONAL, INC.

AFV-13

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2 JUL 79

FM-TR-27-VIII

COMPOSITE SAMPLE NUMBER	SOIL TYPE	PERCENT PASSING #200	ATTERBERG LIMITS		SPECIFIC GRAVITY	MAXIMUM DRY DENSITY		OPTIMUM MOISTURE (%)	COMPACTED DRY DENSITY		COMPACTED MOISTURE (%)	PERCENT OF MAXIMUM DRY DENSITY	CBR (%)
			LL	PI		pcf	kg/m³		pcf	kg/m³			
E	SM	15				130.2	2086	8.5	120.1	1924	8.4	92.2	35
									113.8	1823	8.4	87.4	8
F	SM	15				114.0	1826	10.6	110.4	1768	10.3	96.8	84
									105.5	1690	10.3	92.5	32
									100.8	1615	10.4	88.4	12
G	SM	34	22	3		128.0	2050	9.5	125.9	2017	9.5	98.4	55
									118.5	1898	9.6	92.6	17
									111.2	1781	9.4	86.9	5
H	SP-SM	5		NP		129.5	2074	8.0	124.6	1996	7.1	96.2	59
									119.9	1921	7.4	92.6	33

CALIFORNIA BEARING RATIO (CBR) TEST RESULTS
VERIFICATION SITE, BIG SMOKY COR, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

TABLE 9-6 2 OF 4

WOODWARD-CLYDE CONSULTANTS

AFV-13

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2 JUL 79

PM-TR-27-VIII

COMPOSITE SAMPLE NUMBER	SOIL TYPE	PERCENT PASSING #200	ATTERBERG LIMITS		SPECIFIC GRAVITY	MAXIMUM DRY DENSITY		OPTIMUM MOISTURE (%)	COMPACTED DRY DENSITY		COMPACTED MOISTURE (%)	PERCENT OF MAXIMUM DRY DENSITY	CBR (%)
			LL	PI		pcf	kg/m³		pcf	kg/m³			
I	SM-SC	38	25	6		118.5	1898	14.1	115.3	1847	13.8	97.3	7
									107.6	1724	14.2	90.8	5
									98.9	1584	14.0	83.5	2
J	ML	73	22	1		114.5	1834	14.7	107.9	1728	14.7	94.2	10
									103.7	1661	14.6	90.6	3
									99.4	1592	14.7	86.8	2
K	SC	32	33	11		128.3	2055	10.6	120.7	1933	12.0	94.1	28
									115.5	1850	12.8	90.1	20
L	SW-SM	9				133.4	2137	8.3	128.7	2062	8.0	96.5	89
									124.2	1989	8.1	93.1	39
									121.1	1940	7.9	90.8	23

CALIFORNIA BEARING RATIO (CBR) TEST RESULTS
VERIFICATION SITE, BIG SMOKY CDP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

TABLE 9-6
3 OF 4

FUGRO NATIONAL, INC.

AFV-13

COMPOSITE SAMPLE NUMBER	SOIL TYPE	PERCENT PASSING #200	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	SPECIFIC GRAVITY	MAXIMUM DRY DENSITY pcf	MAXIMUM DRY DENSITY kg/m3	OPTIMUM MOISTURE (%)	COMPACTED DRY DENSITY pcf	COMPACTED DRY DENSITY kg/m3	COMPACTED MOISTURE (%)	PERCENT OF MAXIMUM DRY DENSITY	CBR (%)
M	SM	27				120.5	1930	10.5	116.5	1866	10.6	96.6	67
									111.6	1788	10.9	92.6	37
									107.5	1722	10.8	89.2	11

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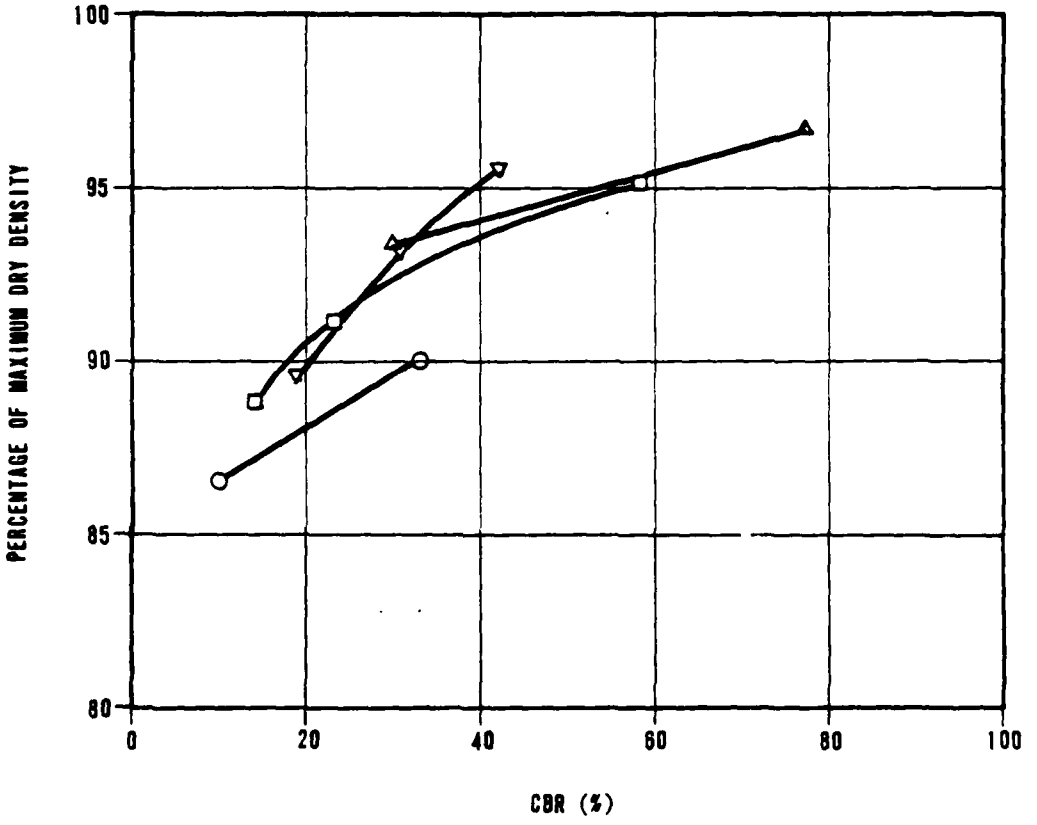
CALIFORNIA BEARING RATIO (CBR) TEST RESULTS
VERIFICATION SITE, BIG SMOKY COP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

TABLE 9-6 4 OF 4

FUGRO NATIONAL, INC.



SYMBOL	COMPOSITE SAMPLE NUMBER	SOIL TYPE
○	A	SM
□	B	SW-SM
△	C	SM
▽	D	SW-SM

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CALIFORNIA BEARING RATIO (CBR) CURVES
VERIFICATION SITE, BIG SMOKY CDP, NEVADA

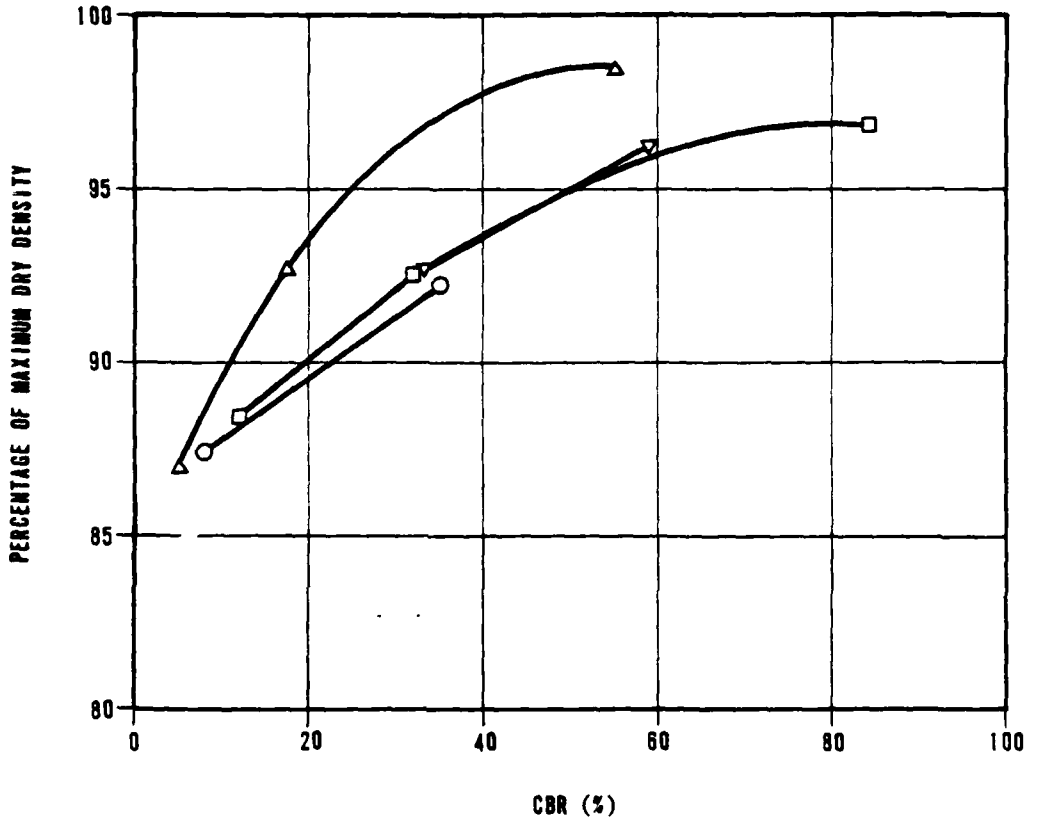
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 9-3
1 OF 4

FUGRO NATIONAL, INC.

2 JUL 79

AFV-14



SYMBOL	COMPOSITE SAMPLE NUMBER	SOIL TYPE
○	E	SM
□	F	SM
△	G	SM
▽	H	SP-SM

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CALIFORNIA BEARING RATIO (CBR) CURVES
VERIFICATION SITE, BIG SMOKY COP, NEVADA

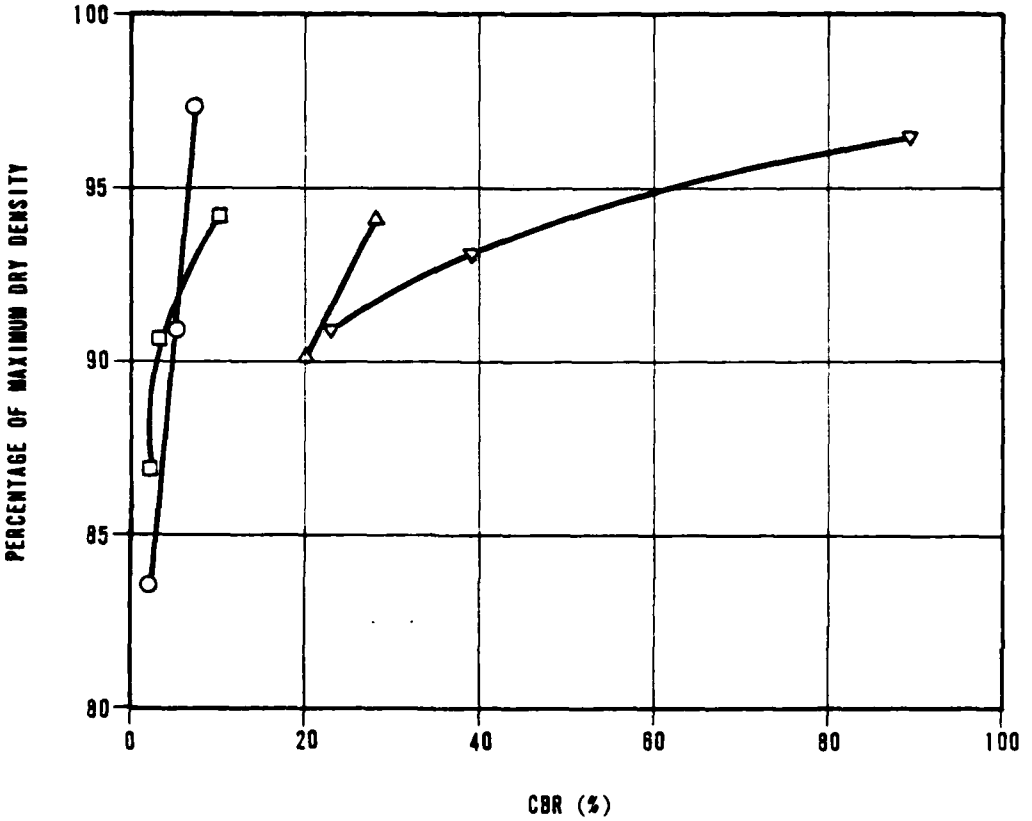
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 9-3
2 OF 4

FUGRO NATIONAL, INC.

2 JUL 79

AFV-14



SYMBOL	COMPOSITE SAMPLE NUMBER	SOIL TYPE
○	I	SM-SC
□	J	ML
△	K	SC
▽	L	SW-SM

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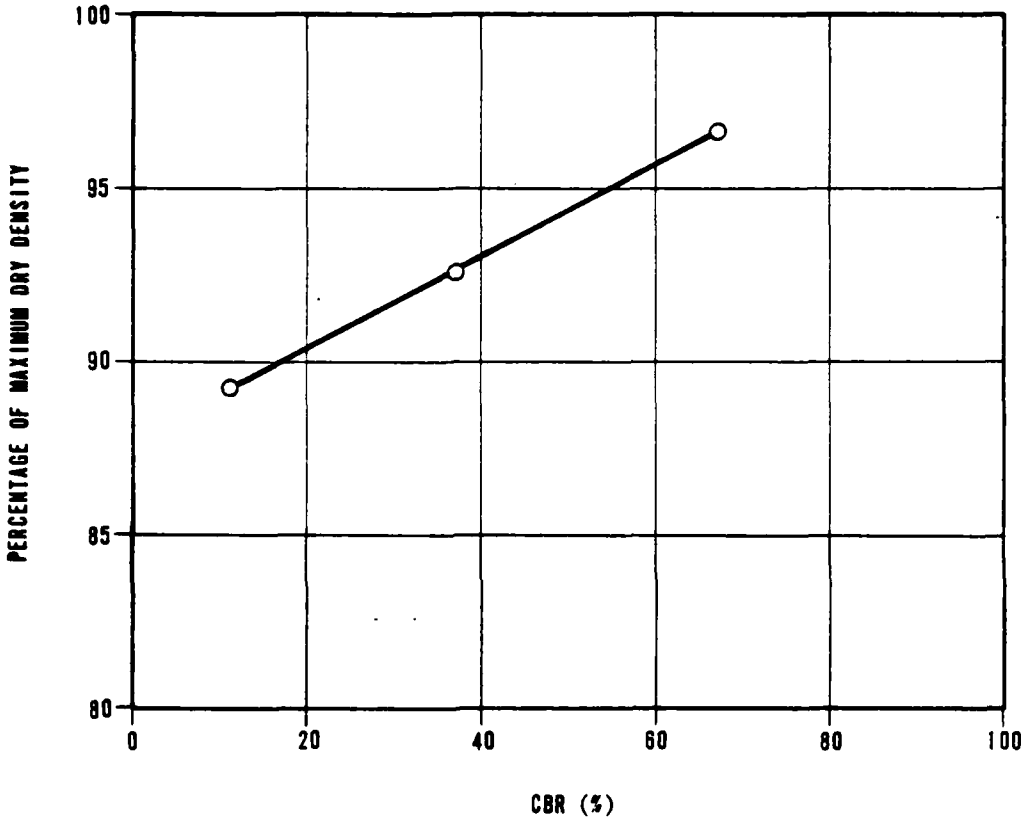
CALIFORNIA BEARING RATIO (CBR) CURVES
VERIFICATION SITE, BIG SMOKY CDP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 9-3
3 OF 4

FUGRO NATIONAL, INC.



SYMBOL	COMPOSITE SAMPLE NUMBER	SOIL TYPE
○	M	SM

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CALIFORNIA BEARING RATIO (CBR) CURVES
VERIFICATION SITE, BIG SMOKY COP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

FIGURE 9-3 4 OF 4

FUGRO NATIONAL, INC.

2 JUL 79

AFV-14

SECTION 10.0

FIELD CBR TEST RESULTS

EXPLANATIONS OF FIELD CBR TEST RESULTS

The results of field CBR tests and related field density, moisture content, and laboratory soil classification tests are presented on the summary table included in this section. The following explanations will aid in reviewing the data included in the table.

A. Definition of California Bearing Ratio (CBR) - California Bearing Ratio (CBR) is the ratio (in percent) of the resistance to penetration developed by a soil to that developed by a specimen of standard crushed-rock base material and is the basis for many empirical road design methods used in this country.

B. Activity Number - Field CBR tests are identified as follows:

BS-F-1

BS - abbreviation for the site (e.g., BS-Big Smoky)
F - abbreviation for field CBR test
1 - number of activity

C. Ground Surface Elevation - Indicated elevations (in feet and meters) are estimated from topographic maps of the study area within an accuracy of half the contour interval.

D. Surficial Geologic Units - Indicates the surficial geologic unit in which the activity is located.

E. USCS - The symbols used are from the Unified Soil Classification System; see Table 6-1 of Section 6.0, "Boring Logs", for details of USCS.

F. Grain-Size Distribution and Plasticity - These are from results of laboratory tests. See Section 6.0, "Boring Logs", for explanations.

G. In-Situ Dry Unit Weight - Indicated dry unit weights are from field density tests conducted at each CBR test site in accordance with ASTM D 1556-64, "Test for Density of Soil in Place by the Sand-Cone Method".

H. Moisture Content - Moisture contents as determined in the field by the "Speedy Moisture Tester".

I. Estimated Percent of Maximum Dry Density - Indicates the ratio (as a percentage) of in-situ dry unit weight to the maximum dry density obtained in the laboratory from ASTM D 1557-70, "Moisture Density Relations of Soils Using 10-pound (4.5 kg) Hammer and 18-inch (457 mm) Drop".

J. Average Field CBR - Average of three field CBR tests performed at each level.

K. Remarks - These include comments about the in-situ soil conditions which may have had significant influence on the CBR test (cementation, cobbles, gravel, and/or unusual moisture content). See Section 6.0, "Boring Logs", for explanation of terms used to describe cementation and cobbles. Indurated indicates soil or rock hardened by heat, pressure and/or cementation. Disseminated caliche indicates a scattered distribution of calcium carbonate in the soil profile.

SECTION 10.0

FIELD CBR TEST RESULTS

FN-TR-27-VIII

ACTIVITY NUMBER	GROUND SURFACE ELEVATION		SURFICIAL GEOLOGIC UNIT	DEPTH		USCS	GRAIN SIZE DISTRIBUTION AND PLASTICITY					IN SITU DRY UNIT WEIGHT		MOISTURE CONTENT	ESTIMATED PERCENT OF MAXIMUM DRY DENSITY	AVERAGE FIELD COR
	FEET	METERS		FEET	METERS		GR	SA	FI	LL	PI	(pcf)	(kg m^3)	(%)		(%)
BS-F-1	5380	1640	A5i	1.0	0.30	SM	18	70	12		NP	98.2	1573	12.8	88	28
				1.8	0.55	SP-SM	21	71	8			100.1	1604	8.0	91	24
BS-F-2	5145	1568	A5y	1.0	0.30	SM	14	72	14			103.7	1661	9.0	94	11
				2.0	0.61	SW-SM	4	90	6			102.3	1639	4.4	85	14
BS-F-3	5080	1548	A5y	1.0	0.30	SM	23	63	14	23	2	101.9	1632	9.8	93	15
				1.7	0.52	SW-SM	10	79	11			107.7	1725	8.2	93	41
BS-F-4	4942	1506	A5y	1.0	0.30	SM	16	69	15			103.0	1650	5.8	78	15
				1.7	0.52	SM	14	71	15		NP	111.0	1778	5.2	85	39
BS-F-5	4872	1485	A5y/A3	1.0	0.30	SP-SM	9	79	12			90.8	1454	7.0	80	8
				1.7	0.52	SM	3	82	15			96.4	1544	4.9	85	28
BS-F-6	4922	1500	A5y/A3	1.0	0.30	SM	6	77	17			105.4	1688	8.0	95	10
				2.0	0.61	SW-SM	15	78	7			102.7	1645	4.8	82	31
BS-F-7	4905	1495	A1/A5y	1.2	0.36	SM	9	77	14			97.1	1555	5.8	85	13
				2.2	0.67	SW-SM	12	77	11			100.2	1605	3.6	81	17
BS-F-8	4897	1493	A5y/A4	0.5	0.15	SM	7	59	34	22	3	102.6	1644	6.4	80	17
				1.5	0.46	SP-SM	23	68	9		NP	110.5	1770	3.2	83	38
BS-F-9	4878	1487	A5y/A4	0.7	0.21	GP	52	44	4		NP	116.2	1861	2.2	90	48
				1.7	0.52	GP	50	48	2							31
BS-F-10	5980	1823	A1/A5y	1.0	0.30	SM	16	67	17			99.3	1591	8.8	80	10
				1.8	0.55	SP	38	59	3			120.6	1932	2.2	93	22
BS-F-11	5014	1528	A1	0.5	0.15	SC-SM	1	61	38	25	8	88.7	1421	12.3	75	11
				1.5	0.46	ML	2	25	73	22	1	75.4	1208	7.1	88	9
BS-F-12	5108	1557	A1	1.0	0.30	SM	8	64	28	21	3	94.5	1514	15.1	77	6
				1.8	0.55	SW-SM	15	74	11			115.8	1855	5.2	89	38
BS-F-13	5130	1564	A5y	0.5	0.15	SM	4	84	12			95.8	1531	12.4	80	4
				2.0	0.61	SM	10	57	33			90.9	1456	12.8	75	4
BS-F-14	5175	1577	A5y	1.0	0.30	SM	2	82	16			104.1	1668	9.0	81	3
				2.0	0.61	SM	13	68	19			84.3	1350	8.3	74	9
BS-F-15	5510	1679	A5i	1.0	0.30	SP-SM	24	65	11			109.4	1752	7.2	84	21
				1.7	0.52	SP-SM	22	72	6			104.8	1679	4.5	78	12
BS-F-16	5570	1698	A5y	1.0	0.30	SM	1	76	23			105.7	1693	7.8	83	20
BS-F-17	5360	1634	A5i	0.5	0.15	SC	23	45	32	33	11	99.5	1594	8.8	78	3
				1.5	0.46	SW-SM	20	72	8			106.8	1708	3.8	80	22
BS-F-18	5338	1627	A5y	1.0	0.30	SM	2	71	27			93.5	1498	8.0	78	4
				1.7	0.52	SM	3	67	30			92.5	1482	8.8	77	4
BS-F-19	5681	1732	A5y	1.3	0.40	SM	3	81	16			104.1	1668	8.2	88	8
				2.0	0.61	SM	3	81	16			96.7	1549	8.8	88	5

ESTIMATED PERCENT OF MAXIMUM DRY DENSITY	AVERAGE FIELD CBR (%)	REMARKS
80	20	Stage I-□ caliche, slightly indurated
81	24	Stage □ caliche, slightly indurated
84	11	Stage I caliche, variable cementation, weak
85	14	Stage □ caliche, weak to slightly indurated
83	15	Stage I caliche, weak
83	41	Stage □ caliche, moderately indurated
78	15	Stage I caliche, slightly indurated
85	39	Stage □ caliche, moderately indurated
80	6	Disseminated caliche, uncemented to weakly cemented
85	28	Stage □ caliche, slightly indurated
85	10	Disseminated caliche, weak
82	31	Stage □ caliche, moderately indurated
85	13	Stage I caliche, weak
81	17	Stage I-□ caliche, slightly indurated
80	17	
83	38	Disseminated caliche, weak
90	48	
	31	Field density not obtained due to soil caving
80	10	Disseminated caliche, weak
93	22	
75	11	
68	8	Collapsing silt
77	6	
88	36	Disseminated caliche, weak
80	4	
75	4	
81	3	
74	9	Stage I caliche, weak
84	21	Stage □ caliche, slightly indurated
79	12	Stage I caliche, weak
83	20	
78	3	
80	22	Stage I caliche, slightly indurated
78	4	
77	4	
88	8	
80	5	

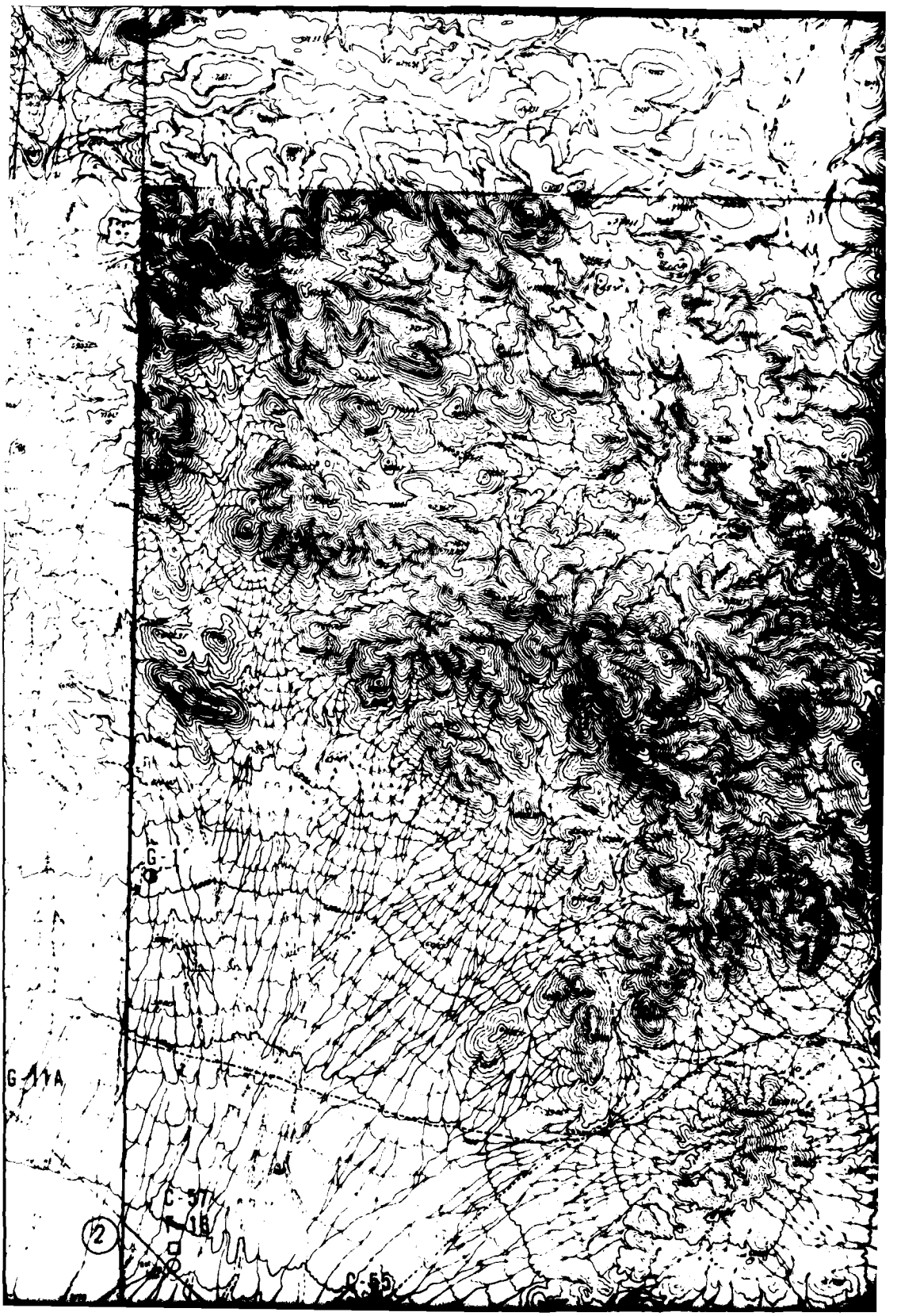
FIELD CBR TEST RESULTS
VERIFICATION SITE, BIG SMOKY CDP, NEVADA

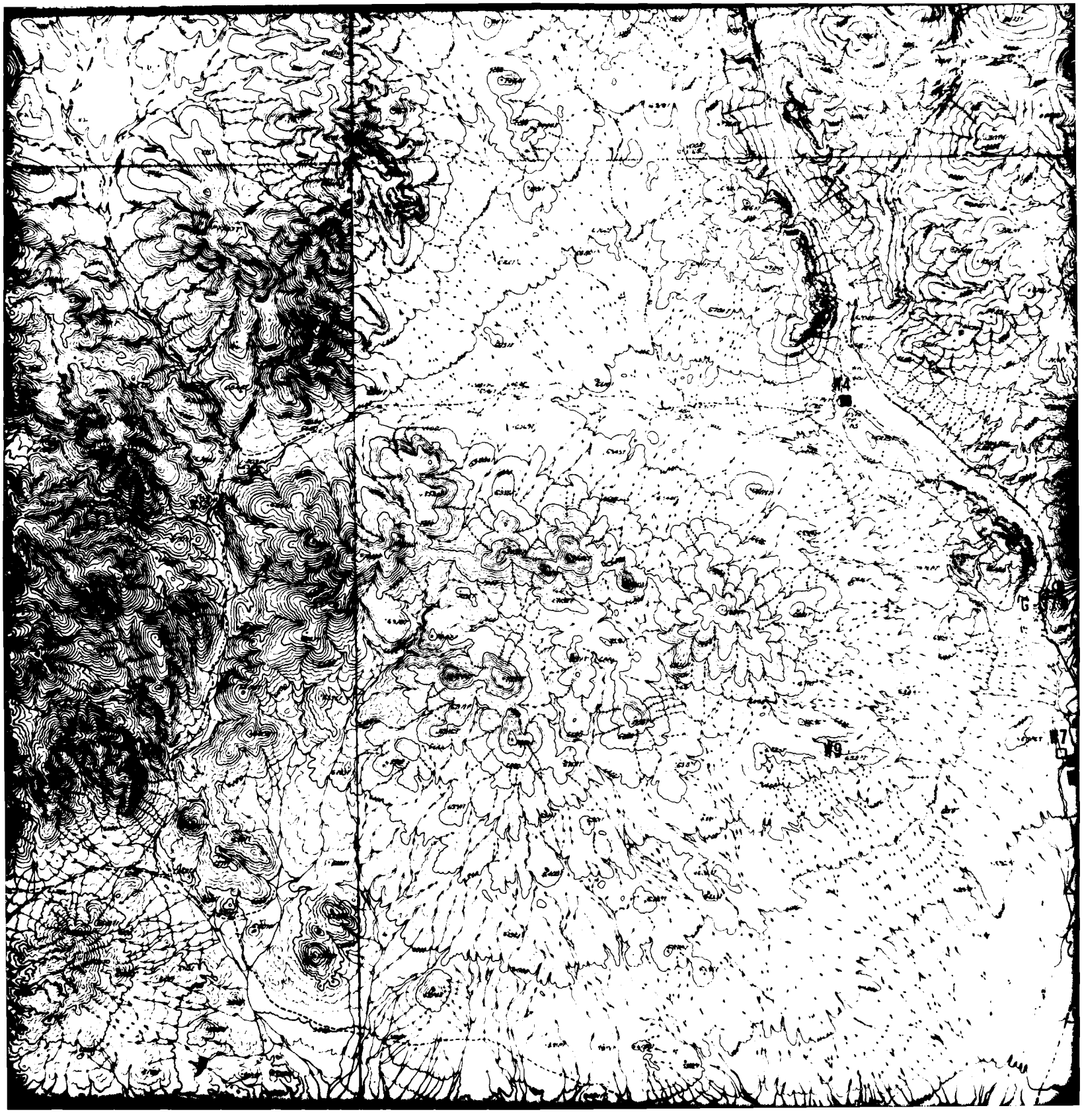
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

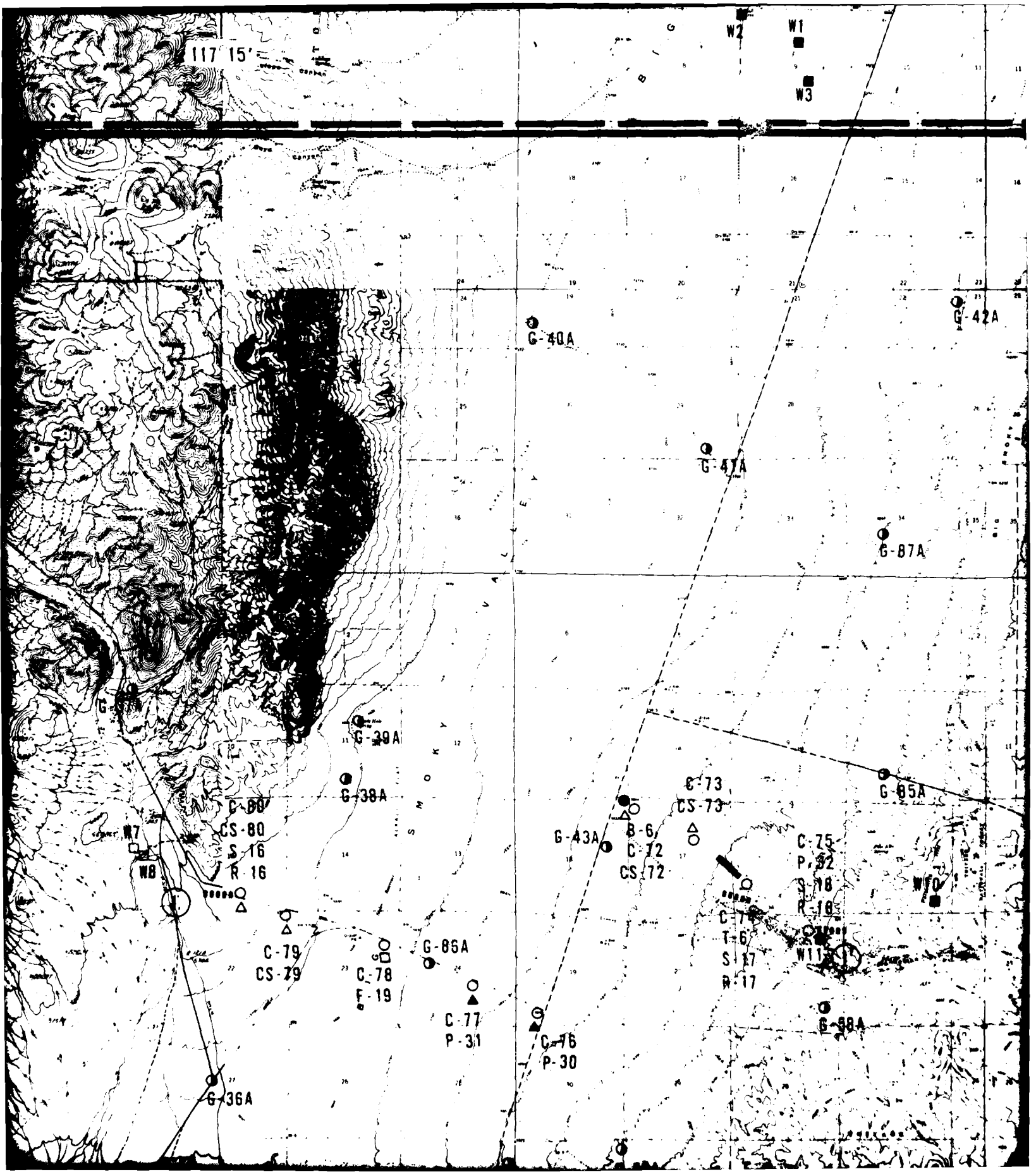
TABLE 10-1

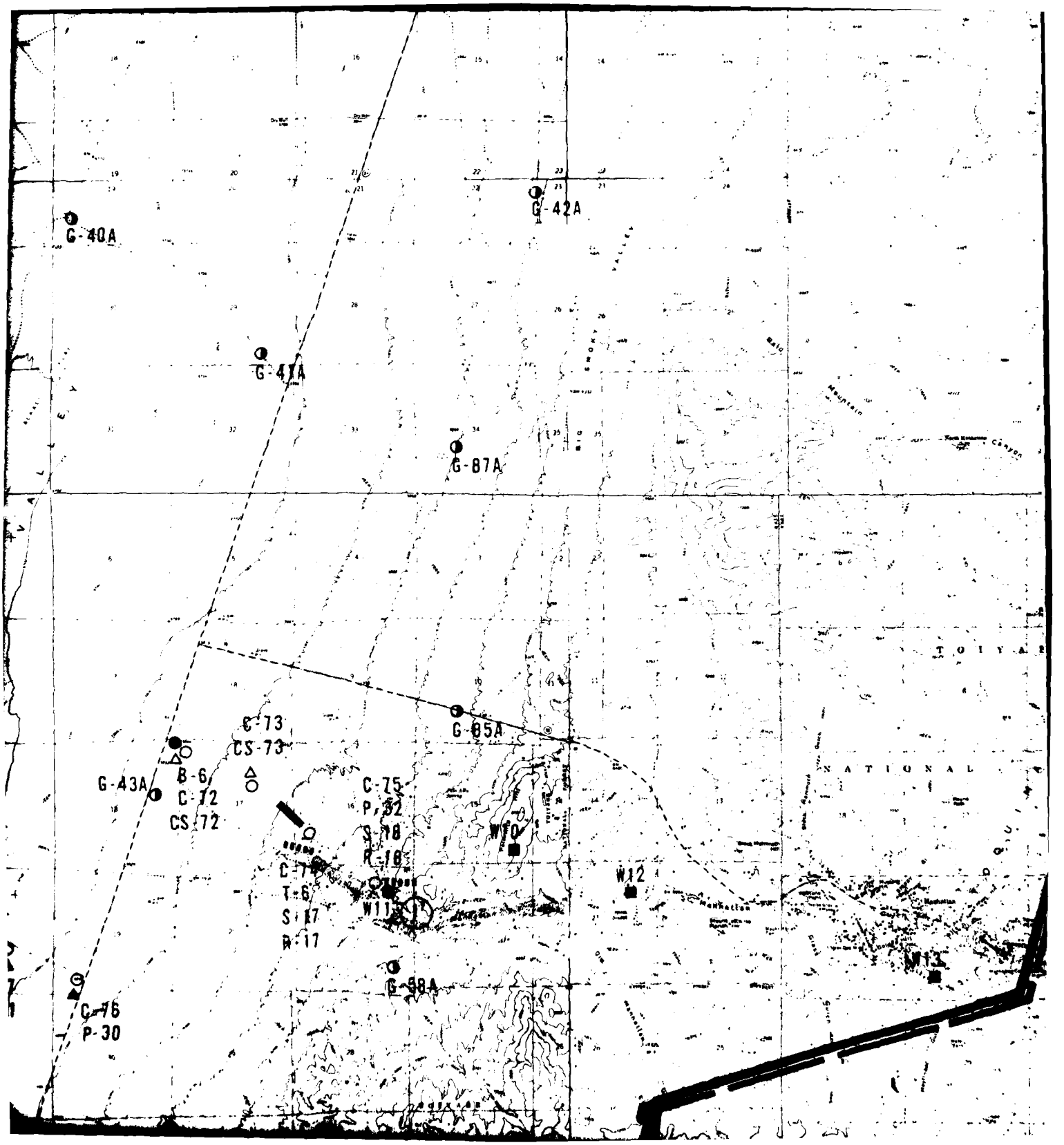
FUGRO NATIONAL, INC.

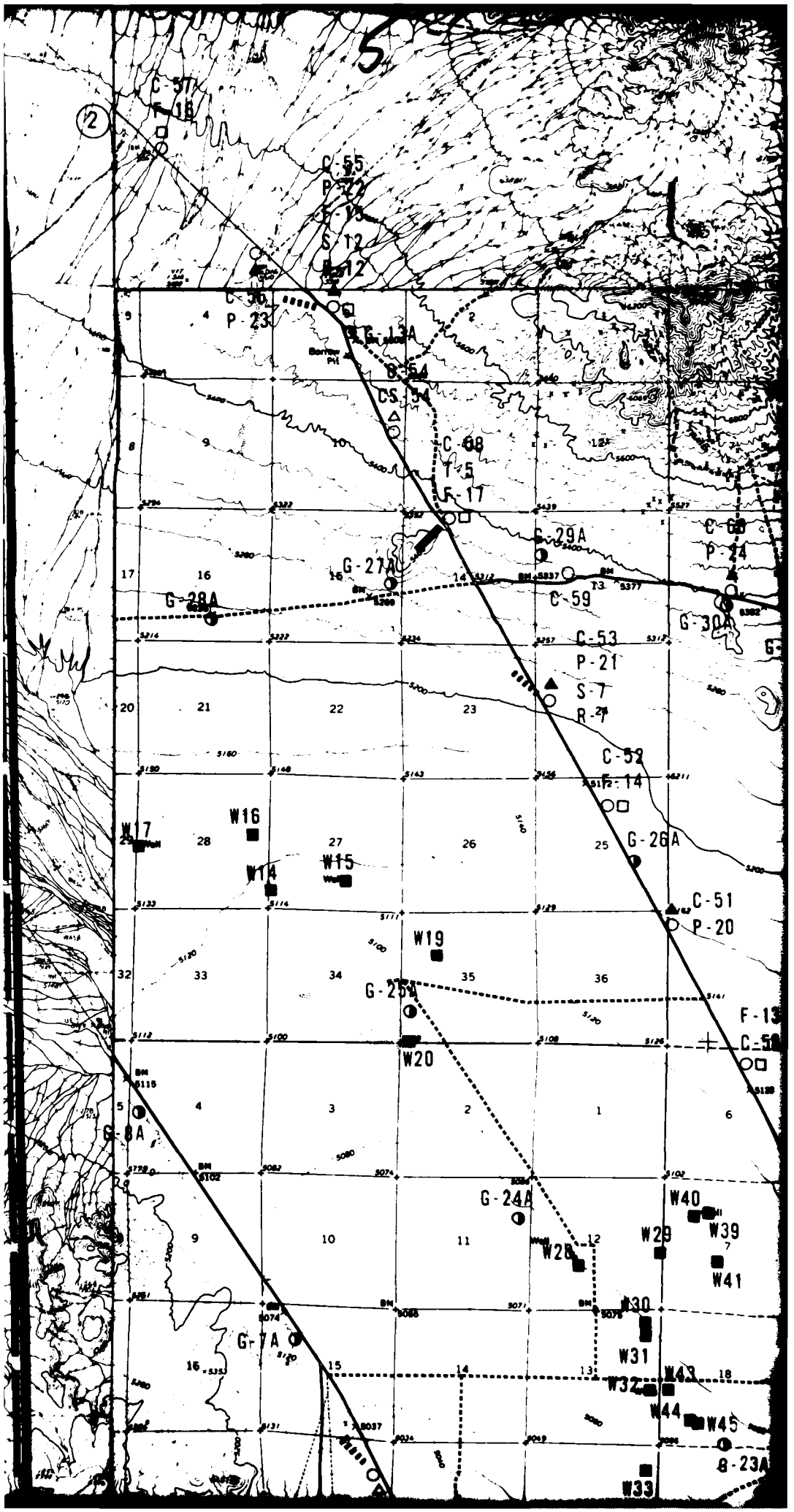
AFV-23

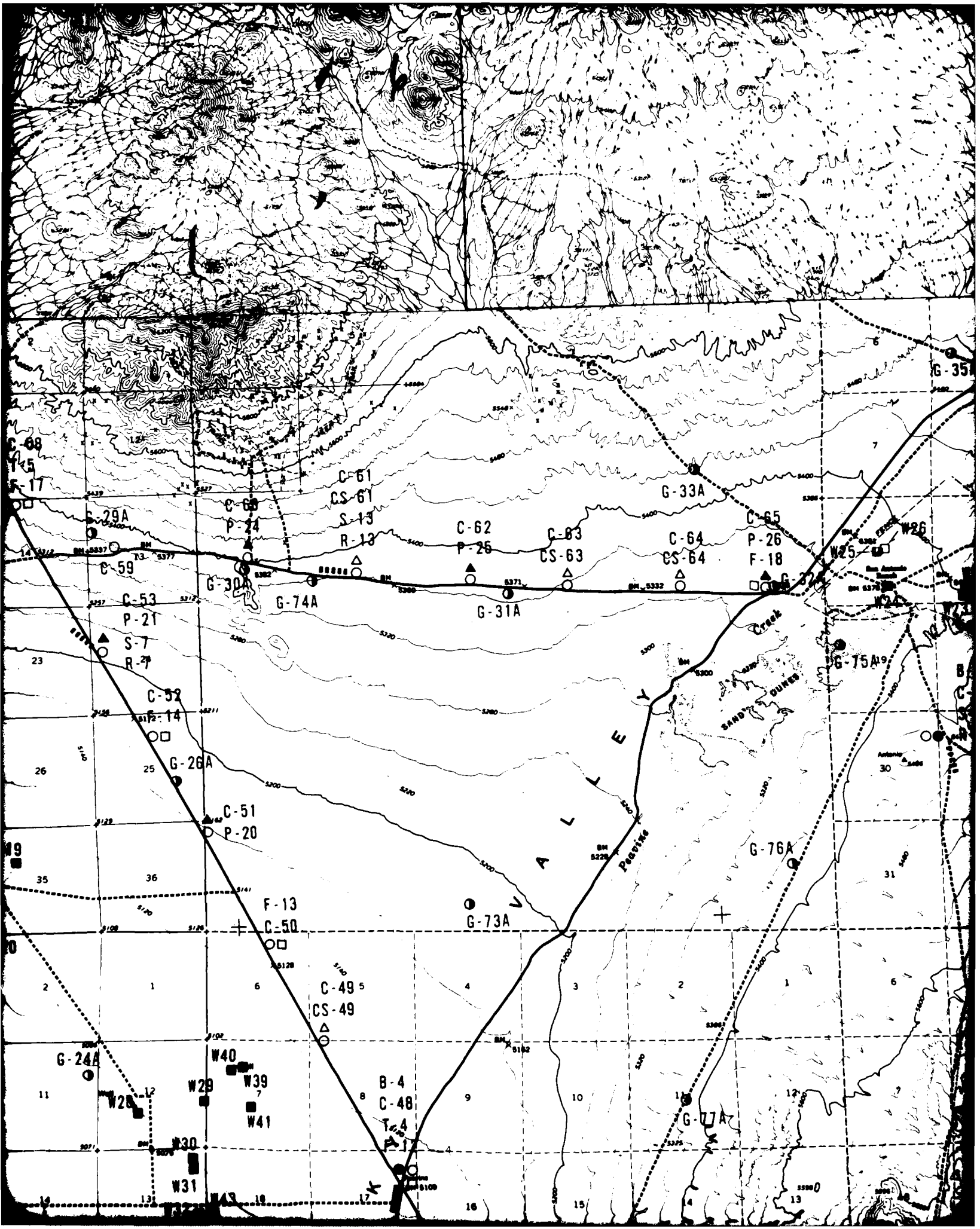

G-1
G-11A
C-37
16
12
C-55

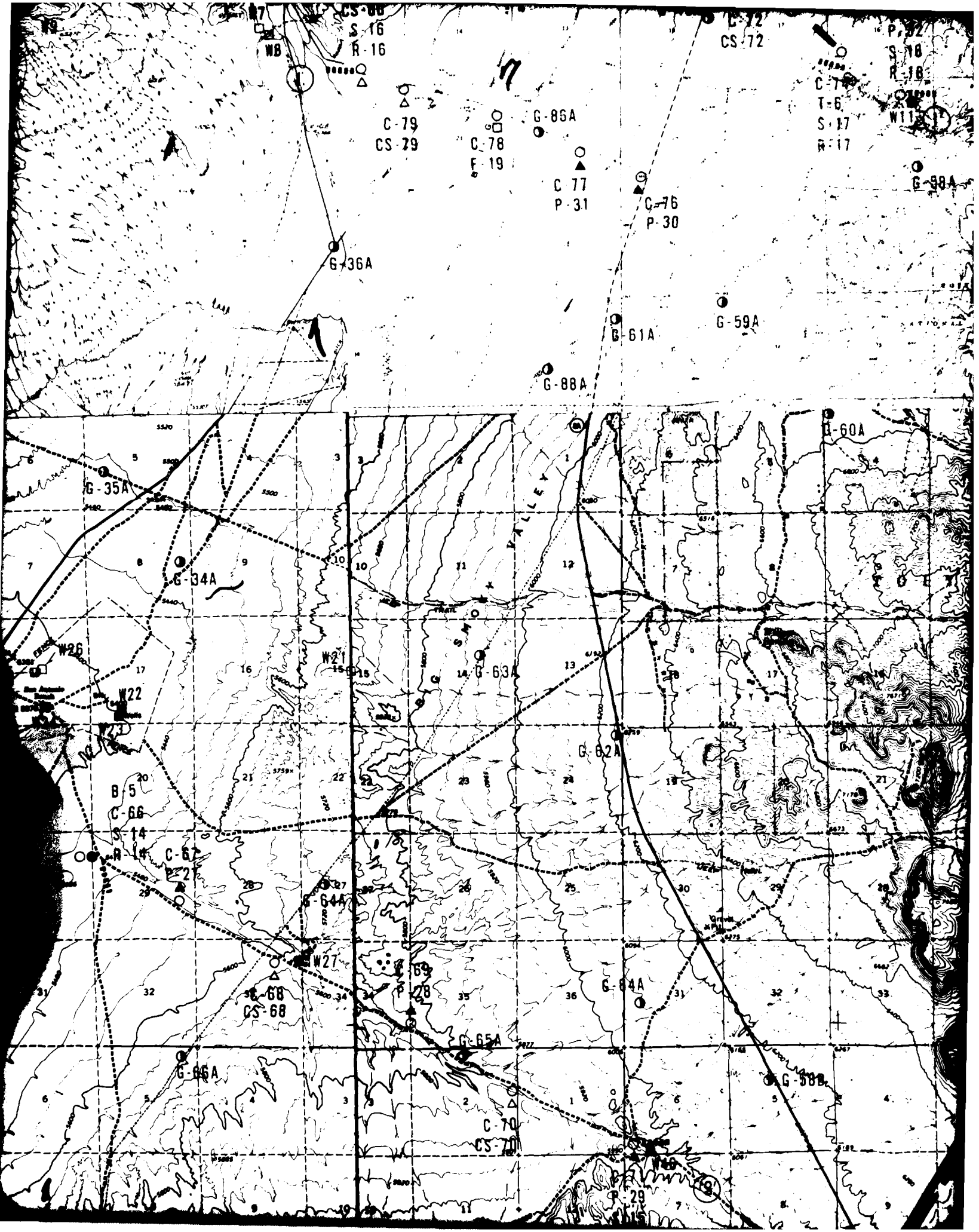

14
16
19
17

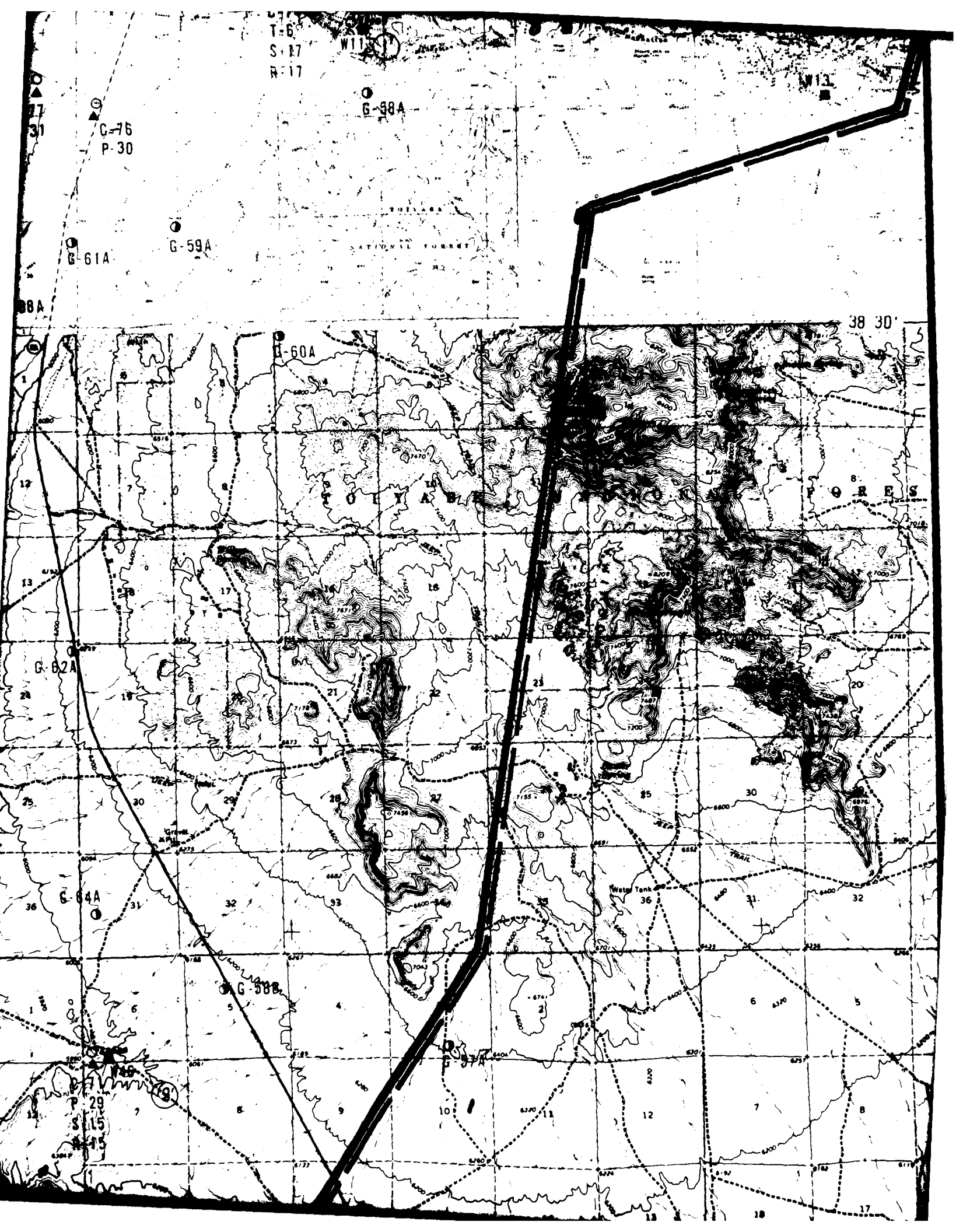

117° 15'
W2
W1
W3
G-42A
G-40A
G-41A
G-87A
G-39A
G-38A
C-80
CS-80
S-16
R-16
W7
W8
C-79
CS-79
G-86A
C-78
F-19
C-77
P-31
G-36A
C-76
P-30
C-73
CS-73
G-85A
G-43A
B-6
C-72
CS-72
C-75
P-32
S-18
R-18
WFO
C-74
T-6
S-17
R-17
W11
G-88A
SMOKY

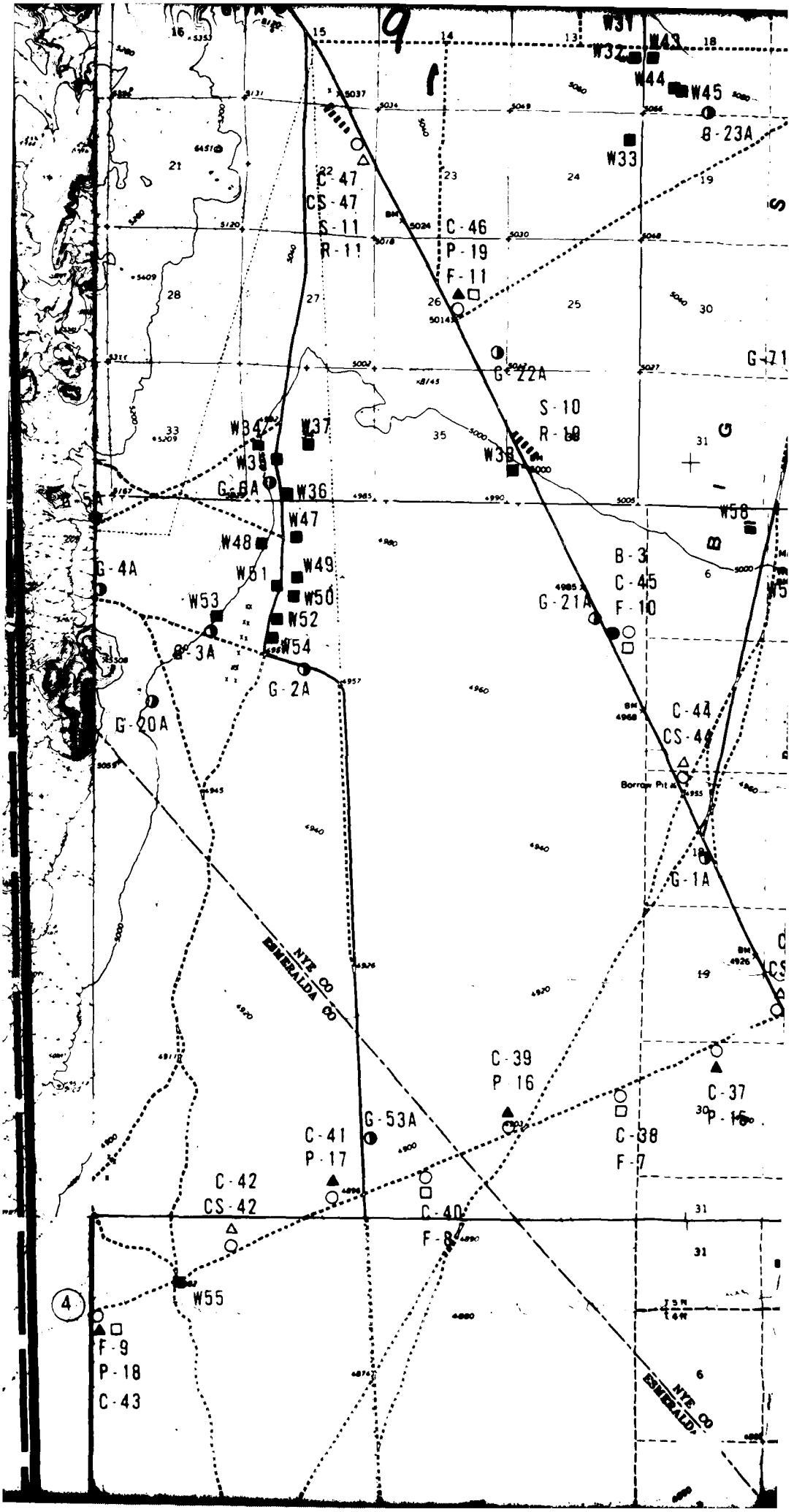

G-40A
G-42A
G-41A
G-87A
G-85A
G-43A
C-73
CS-73
B-6
C-72
CS-72
C-75
P-32
S-18
R-18
C-74
T-6
S-17
R-17
W11
W10
W12
W13
G-88A
C-76
P-30
TOIYABE
NATIONAL

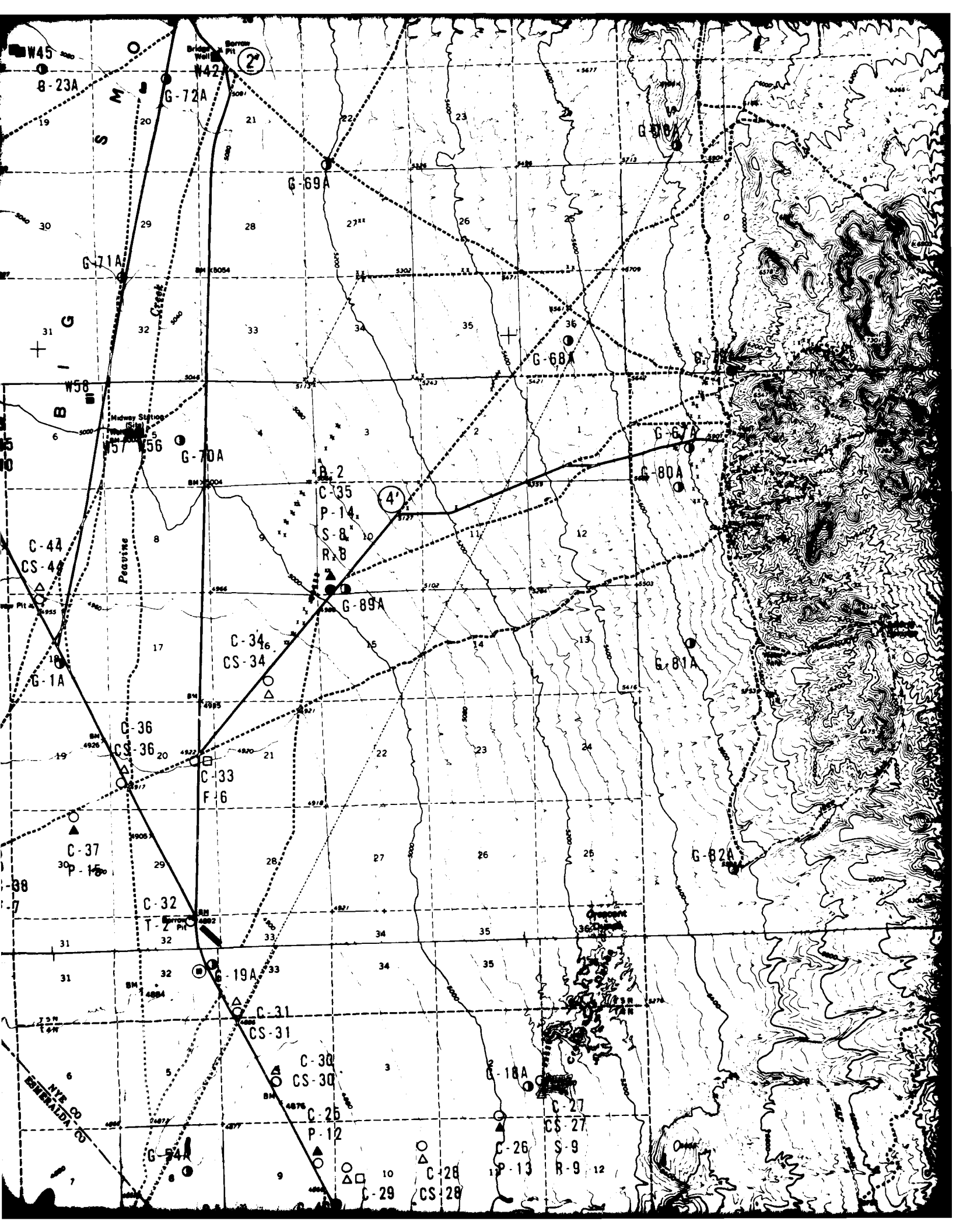

5
C-37
T-16
C-55
P-22
S-13
T-12
R-12
C-56
P-23
G-13A
B-54
CS-54
C-68
T-15
F-17
G-29A
C-69
P-24
G-27A
G-28A
C-59
G-30A
C-53
P-21
S-7
R-21
C-52
F-14
G-26A
W16
W17
W15
W14
C-51
P-20
W19
G-25A
F-13
C-58
W20
G-8A
G-24A
W40
W39
W29
W28
W41
W30
W31
W43
W32
W44
W45
G-7A
B-23A
W33

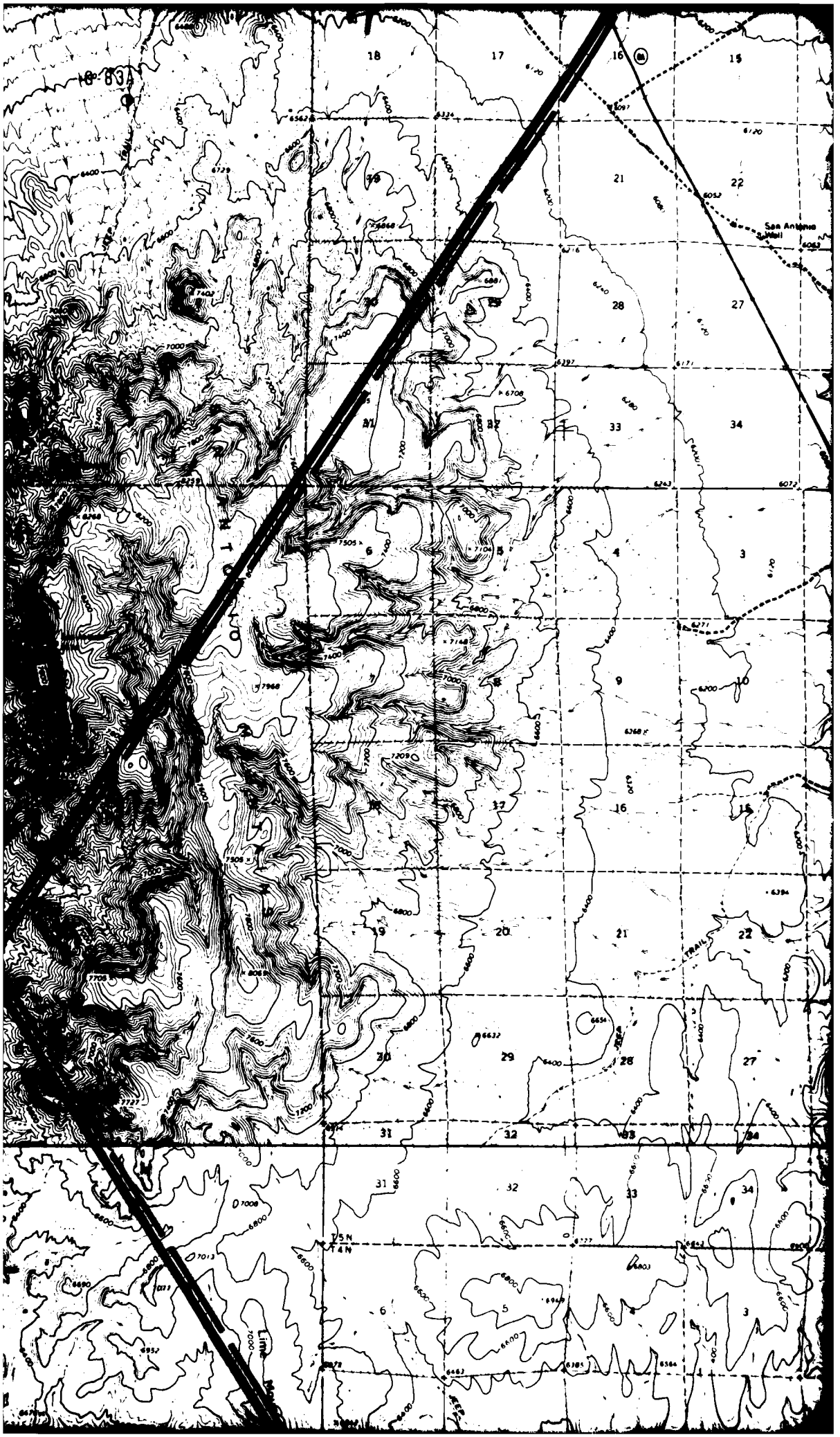

C-68
F-17
C-61
CS-61
S-13
R-13
C-62
P-25
C-63
CS-63
C-64
CS-64
C-65
P-26
F-18
G-33A
G-29A
C-59
C-60
P-24
G-30A
G-74A
G-31A
C-53
P-21
S-7
R-7
C-52
F-14
G-26A
C-51
P-20
F-13
C-50
G-73A
C-49
CS-49
G-24A
W40
W39
W29
W41
W30
W31
B-4
C-48
T-4
P-1
G-76A
G-75A
G-77A
W25
W26
W24
Creek
SAND DUNES
VALLEY
Pacific

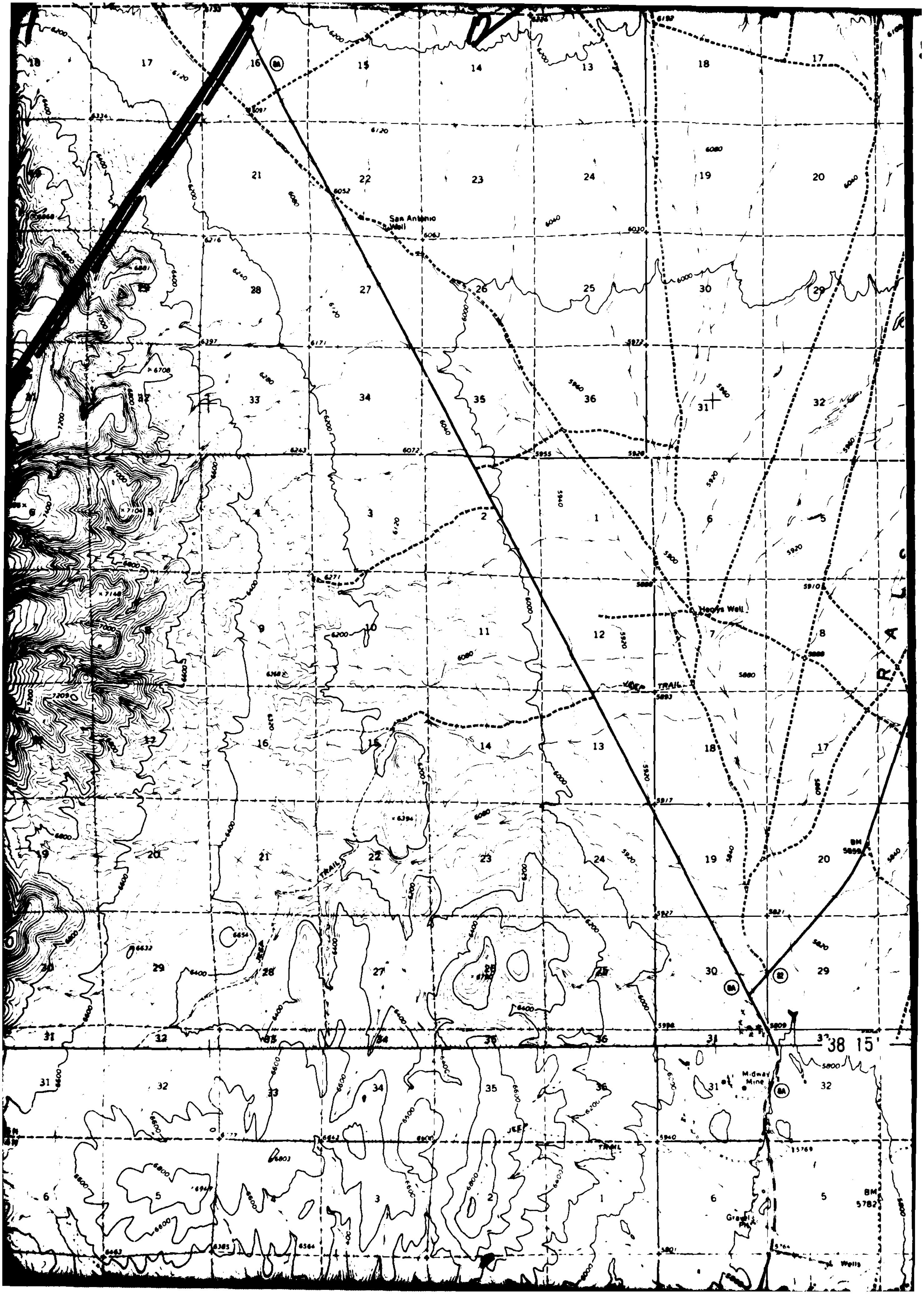

CS-68
S-16
R-16
WB
C-79
CS-29
C-78
P-19
G-86A
C-77
P-31
C-76
P-30
C-72
CS-72
S-18
R-18
T-6
S-17
R-17
W11
G-98A
G-36A
G-59A
G-61A
G-88A
G-60A
G-35A
G-34A
W26
W21
W22
W23
G-63A
G-62A
B-5
C-66
S-14
R-14
C-67
P-27
G-64A
W27
C-69
P-28
G-64A
C-68
CS-68
G-65A
G-66A
G-58A
C-70
CS-70
W10
P-29
SMOKE
VALLEY

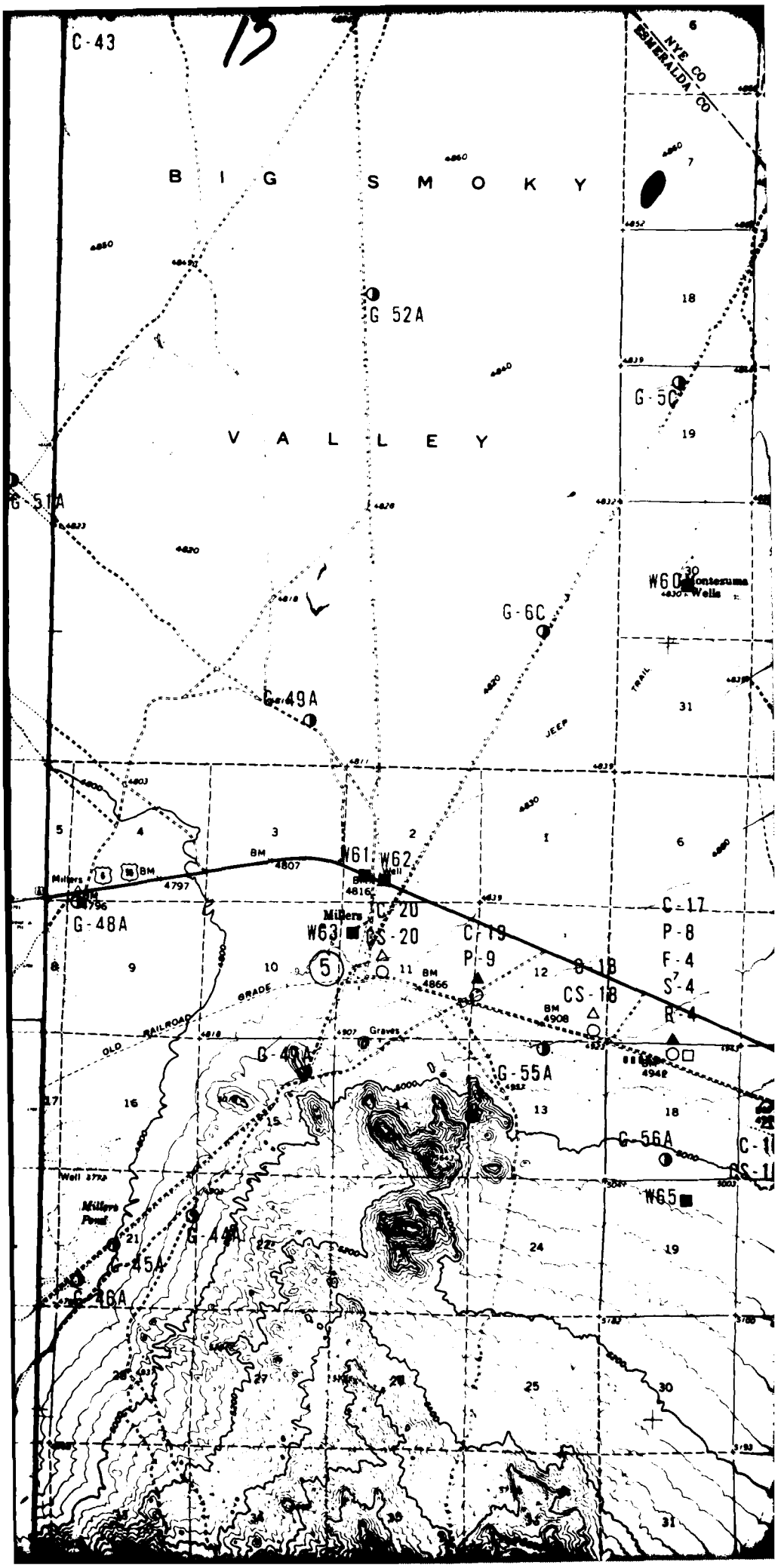

T-6
S-17
R-17
W11
W13
G-58A
C-76
P-30
G-59A
G-61A
G-60A
38 30'
G-62A
G-64A
G-58B
G-57A
Water Tank
TRAIL
P-29
S-15
R-15

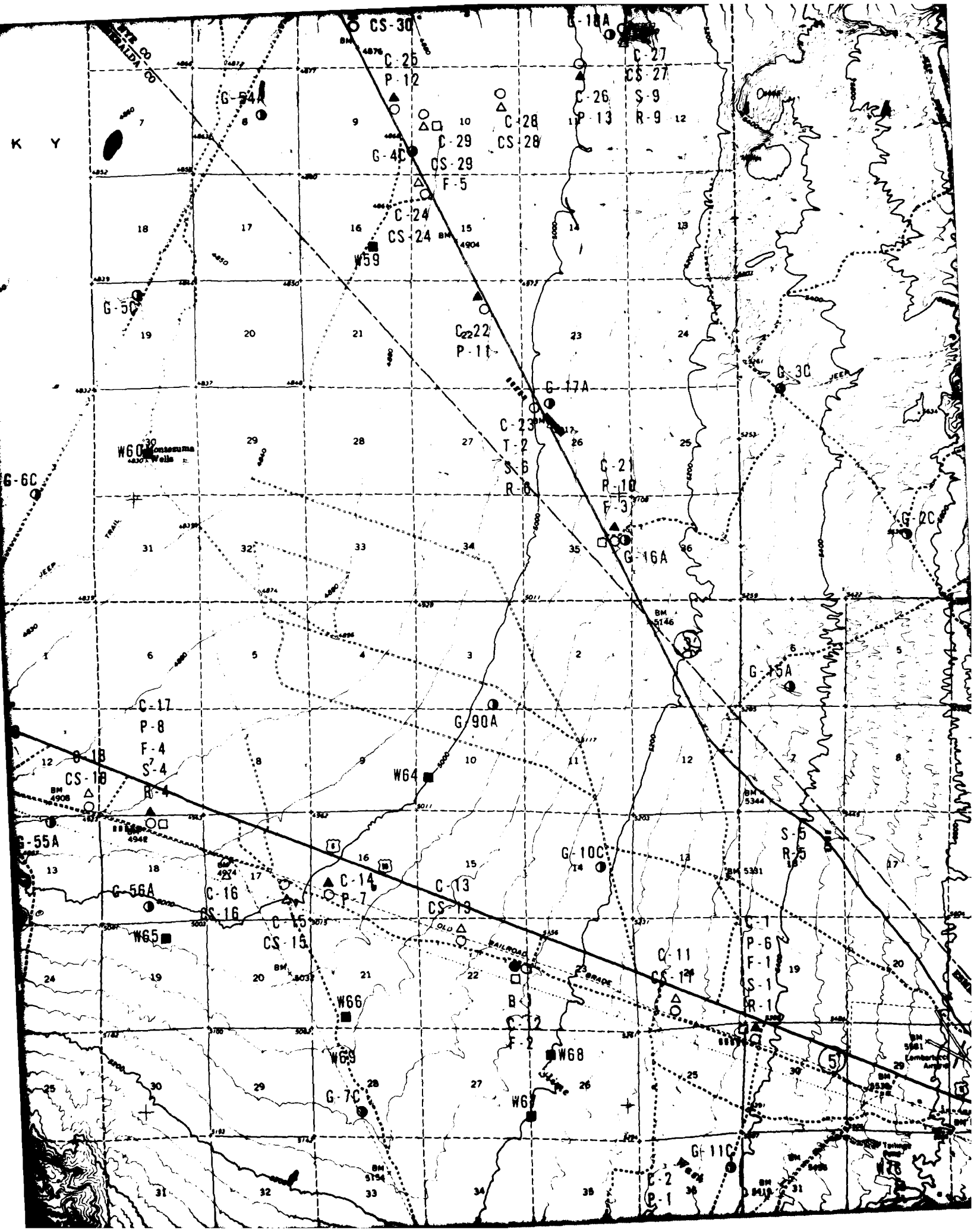

W31
W32
W43
W44
W45
B-23A
W33
C-47
CS-47
S-11
R-11
C-46
P-19
F-11
G-22A
S-10
R-10
G-71
W34
W37
W35
W38
G-6A
W36
W47
W48
W49
W51
W50
W52
W53
W54
G-4A
B-3
C-45
F-10
G-21A
W58
G-3A
G-2A
G-20A
C-44
CS-44
Borrow Pit
G-1A
NYE CO
EMERALDA CO
C-39
P-16
C-37
P-15
G-53A
C-41
P-17
C-38
F-7
C-42
CS-42
C-40
F-8
W55
4
F-9
P-18
C-43
T3N
R4W
NYE CO
EMERALDA


W45
B-23A
W42
G-72A
G-69A
G-71A
G-68A
W58
W57
W56
G-70A
G-67A
G-80A
B-2
C-35
P-14
S-8
R-8
C-44
CS-44
G-89A
C-34
CS-34
G-1A
G-81A
C-36
CS-36
C-33
F-6
C-37
P-15
G-82A
C-32
T-2
G-19A
C-31
CS-31
C-30
CS-30
C-25
P-12
G-18A
C-27
CS-27
S-9
R-9
C-26
P-13
C-28
CS-28
C-29
G-54A
Peavine
Creek
NYE CO
ESMERALDA CO


18
17
16
15
21
22
San Antonio
School
28
27
33
34
4
3
9
10
16
15
21
22
TRAIL
29
28
27
31
32
33
34
31
32
33
34
6
5
3
T5N
T4N
Little
BEER


San Antonio Well
Hoovs Well
JEEP TRAIL
TRAIL
Midway Mine
Gravel Pit
Wells
BM 5859
BM 5782
38 15'


C-43
13
NYE CO
ESMERALDA CO
B I G S M O K Y
V A L L E Y
G-52A
G-5C
G-51A
W60
Montezuma
Wells
G-6C
G-49A
TRAIL
JEEP
W61
W62
Miller's
Well
BM
4807
4797
4816
4796
G-48A
Miller's
W63
C-20
CS-20
C-19
P-9
C-18
CS-18
C-17
P-8
F-4
S-4
R-4
BM
4866
BM
4908
4942
RAILROAD
GRADE
OLD
Graves
G-49A
G-55A
G-56A
W65
Well
Miller's
Pond
G-44A
G-45A
G-46A


CS-30
G-18A
C-27
CS-27
S-9
R-9
C-26
P-13
C-25
P-12
G-54A
C-28
CS-28
C-29
CS-29
F-5
G-4C
C-24
CS-24
W59
G-5C
C-22
P-11
G-17A
G-3C
C-23
T-2
S-6
R-6
C-21
R-10
F-3
W60
Montezuma Wells
G-6C
G-2C
G-16A
BM 5146
G-15A
C-17
P-8
F-4
S-4
R-4
G-90A
W64
C-18
CS-18
G-55A
G-10C
S-5
R-5
C-14
P-7
C-13
CS-13
C-16
CS-16
G-56A
C-15
CS-15
W65
C-1
P-6
F-1
S-1
R-1
C-11
CS-11
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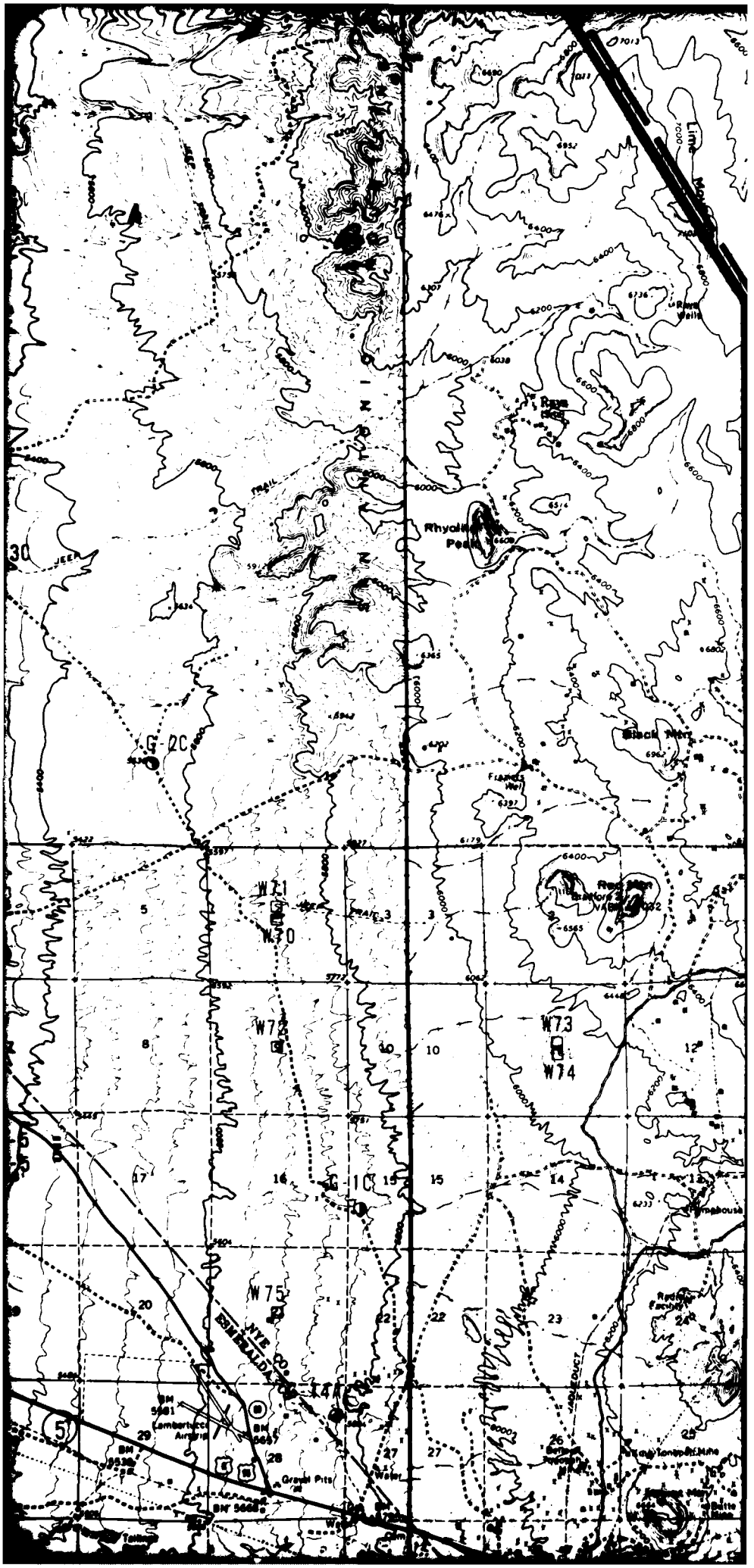
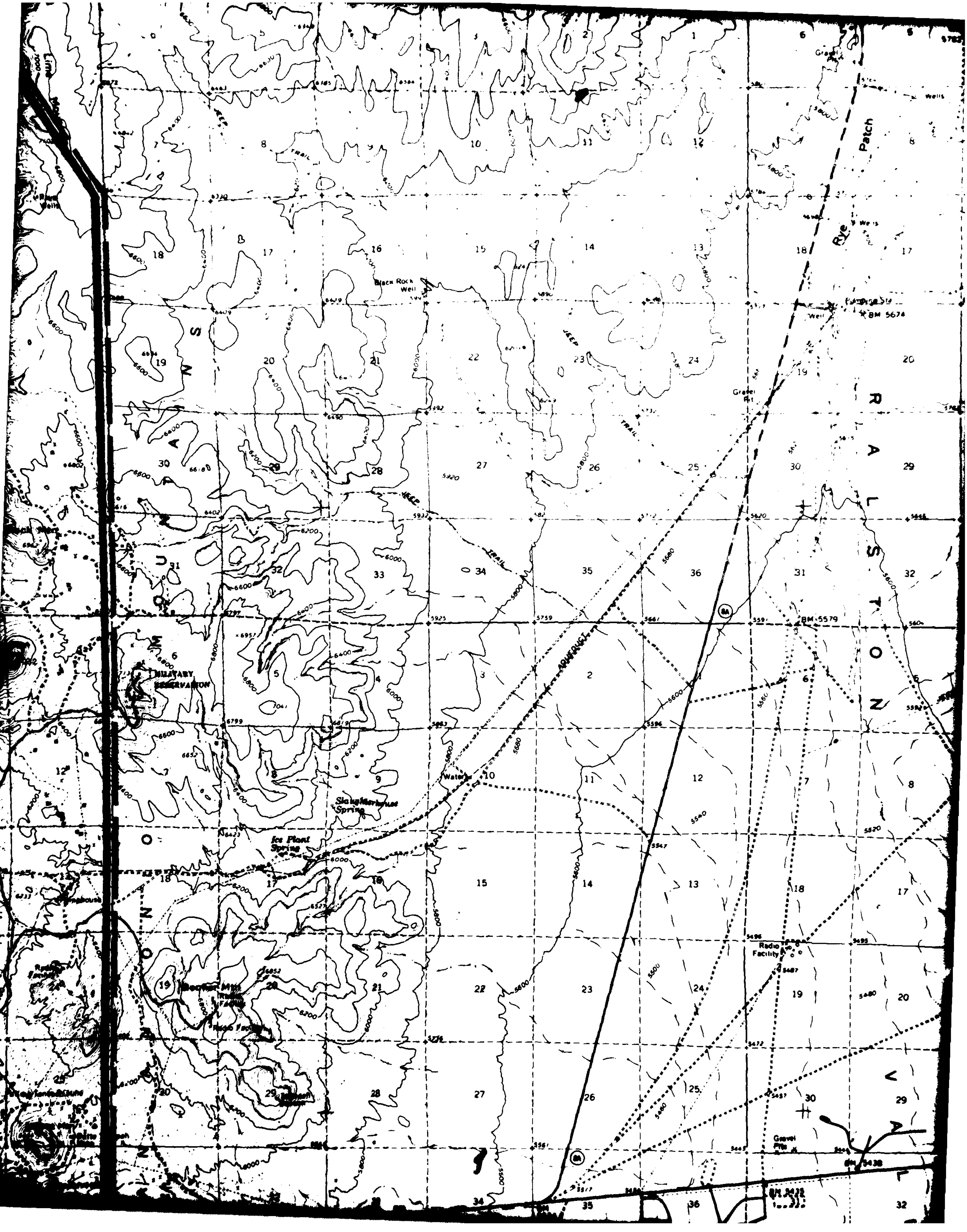
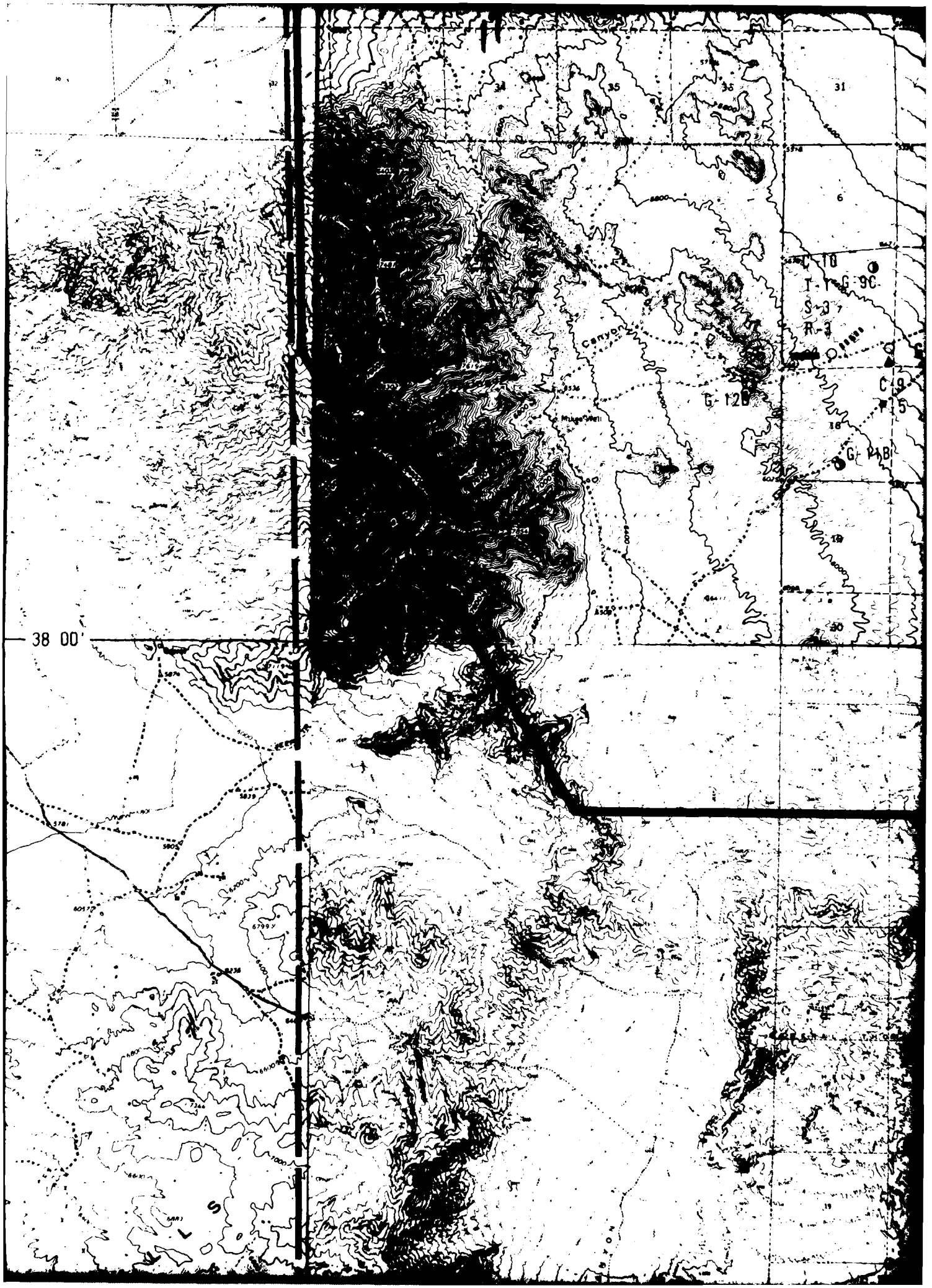
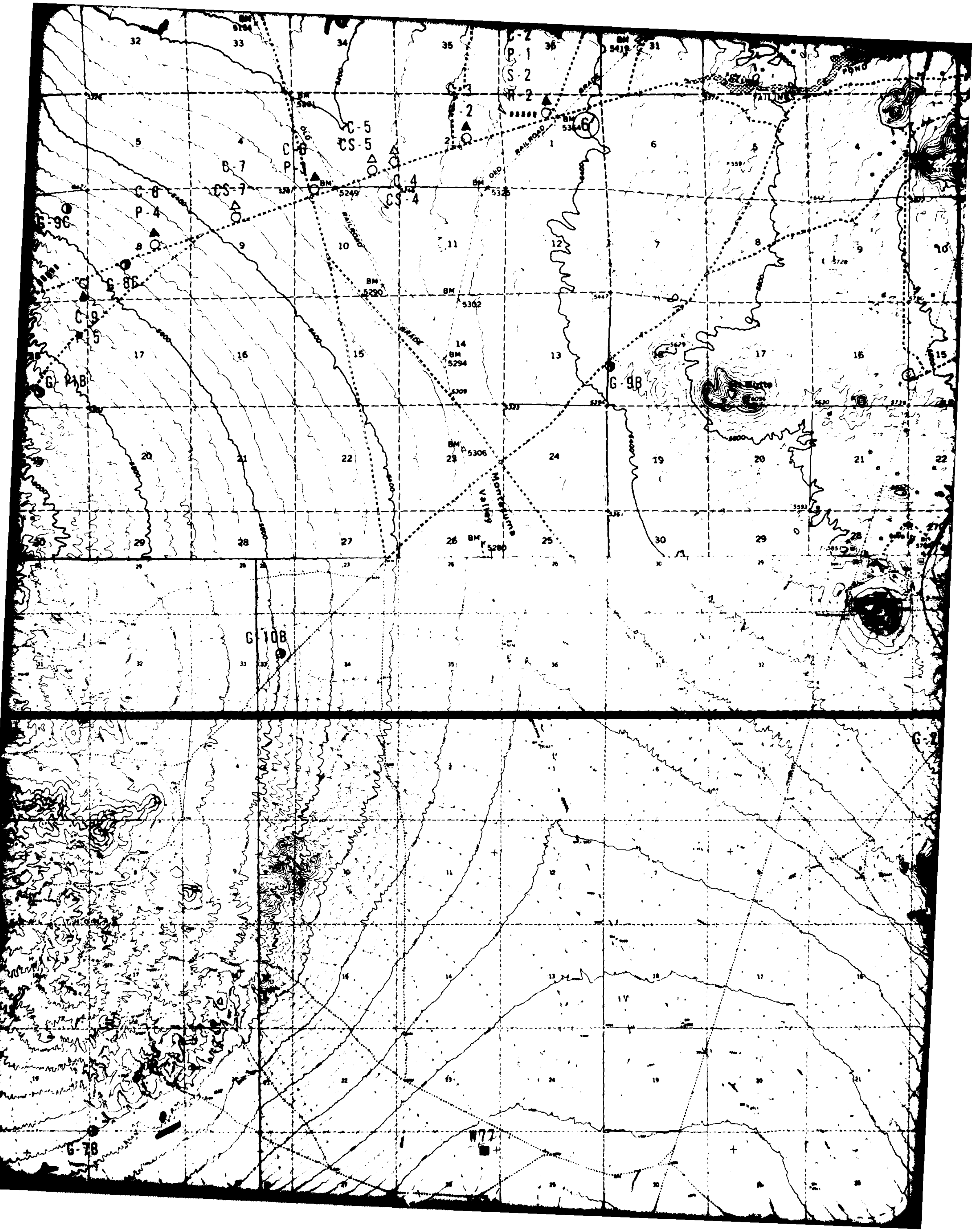
C-12
F-2
W68
W69
G-7C
W67
G-11C
C-2
P-1

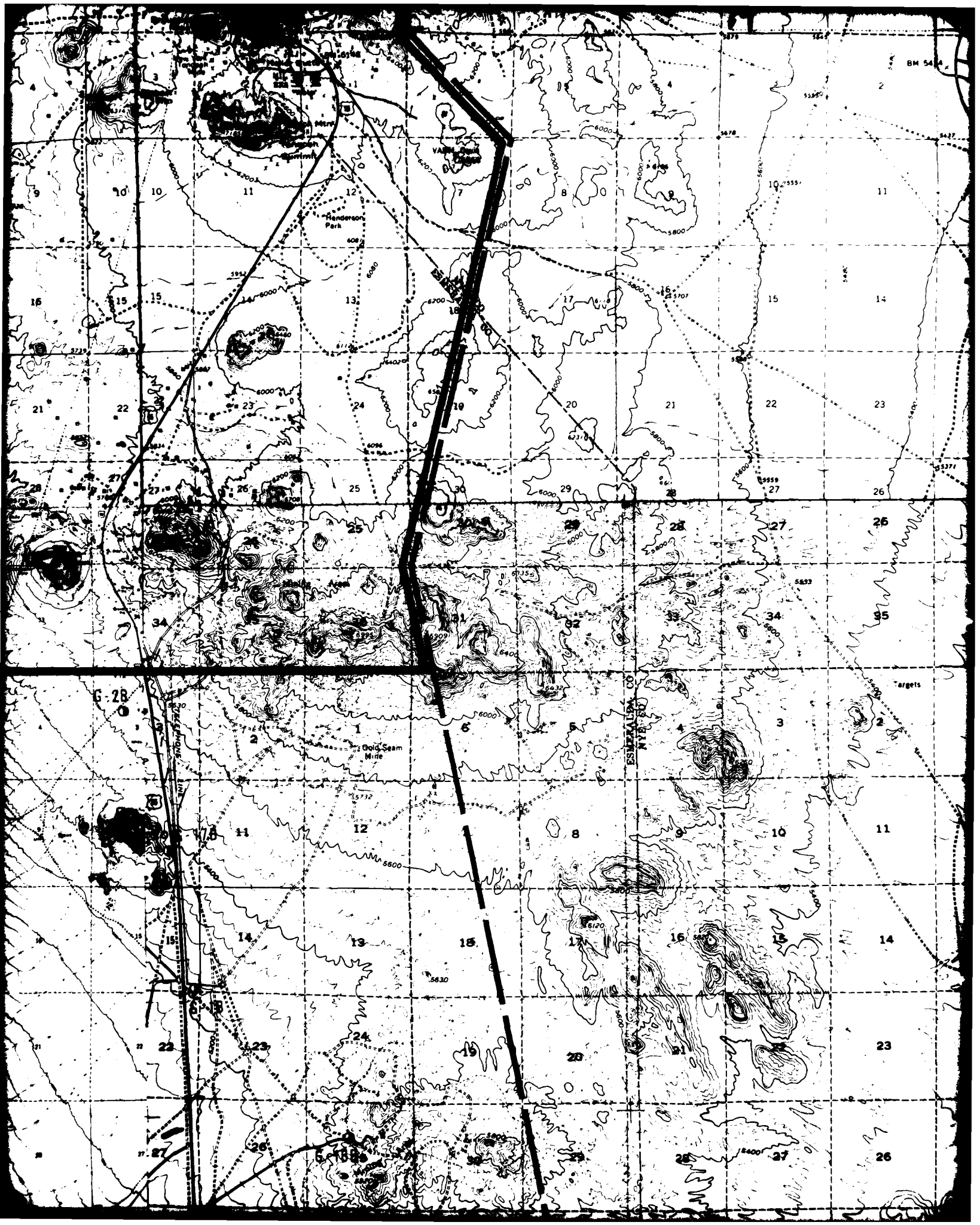

Rhyolite Peak
Black Mtn
W70
W71
W72
W73
W74
W75
NYE CO
ESMERALDA CO
Lime
Water
Tonopah

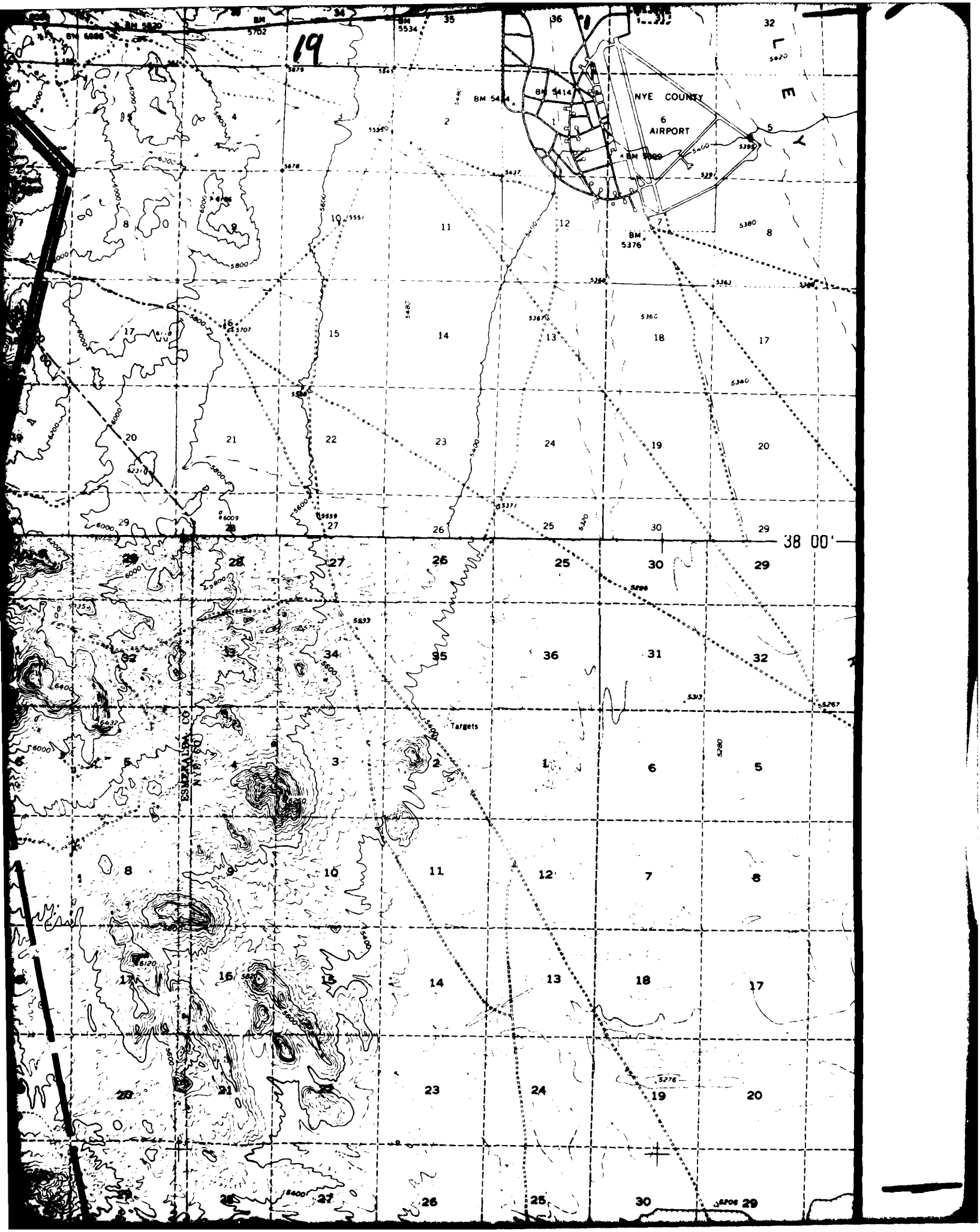


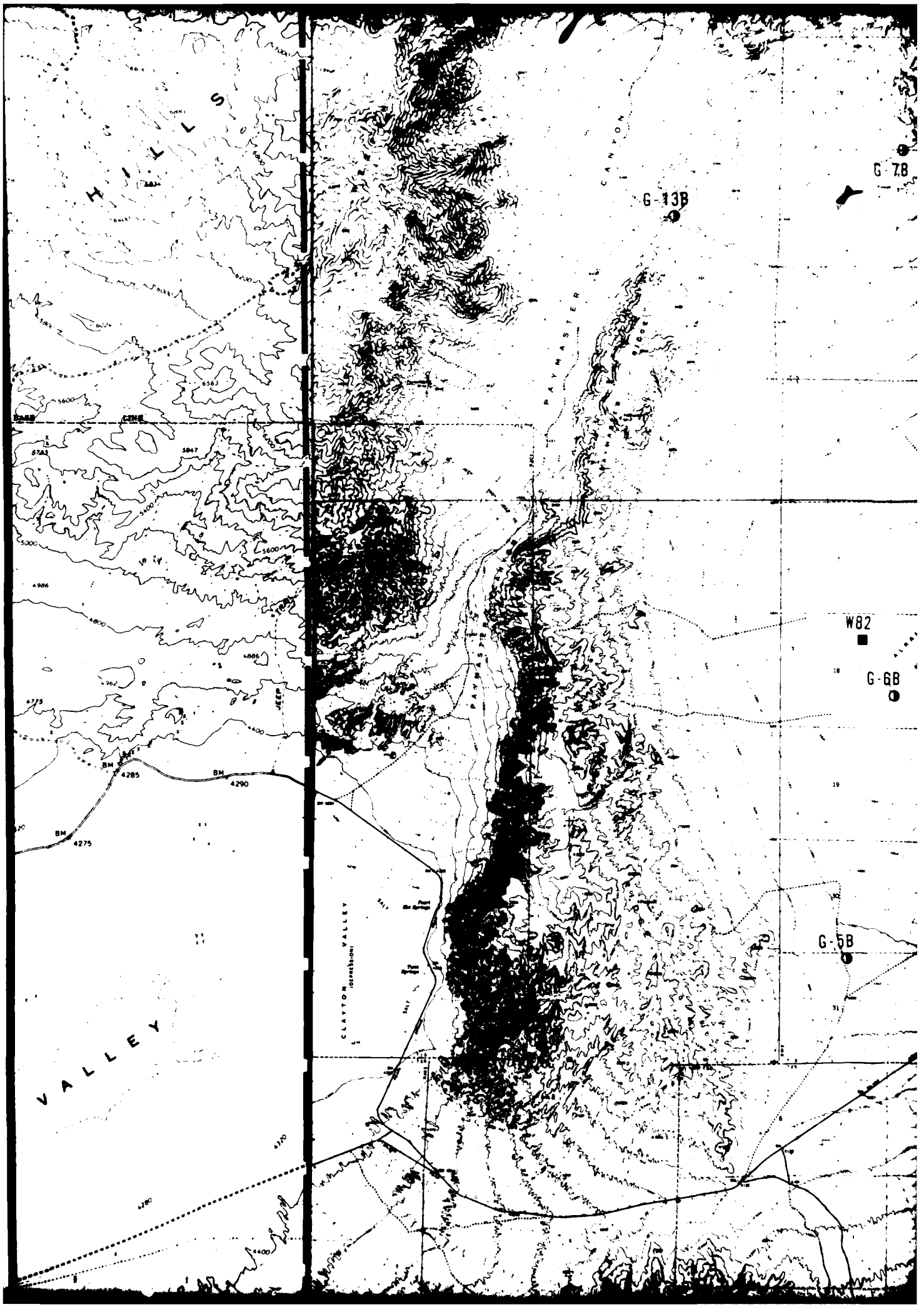
Black Rock Well
JEEP TRAIL
Rye Patch
Wells
Pumping Sta
Well
BM 5674
Gravel Pit
AQUEDUCT
BM 5579
MILITARY RESERVATION
Water
Slaughterhouse Spring
Ice Plant Spring
Radio Facility
Gravel Pits
BM 5438

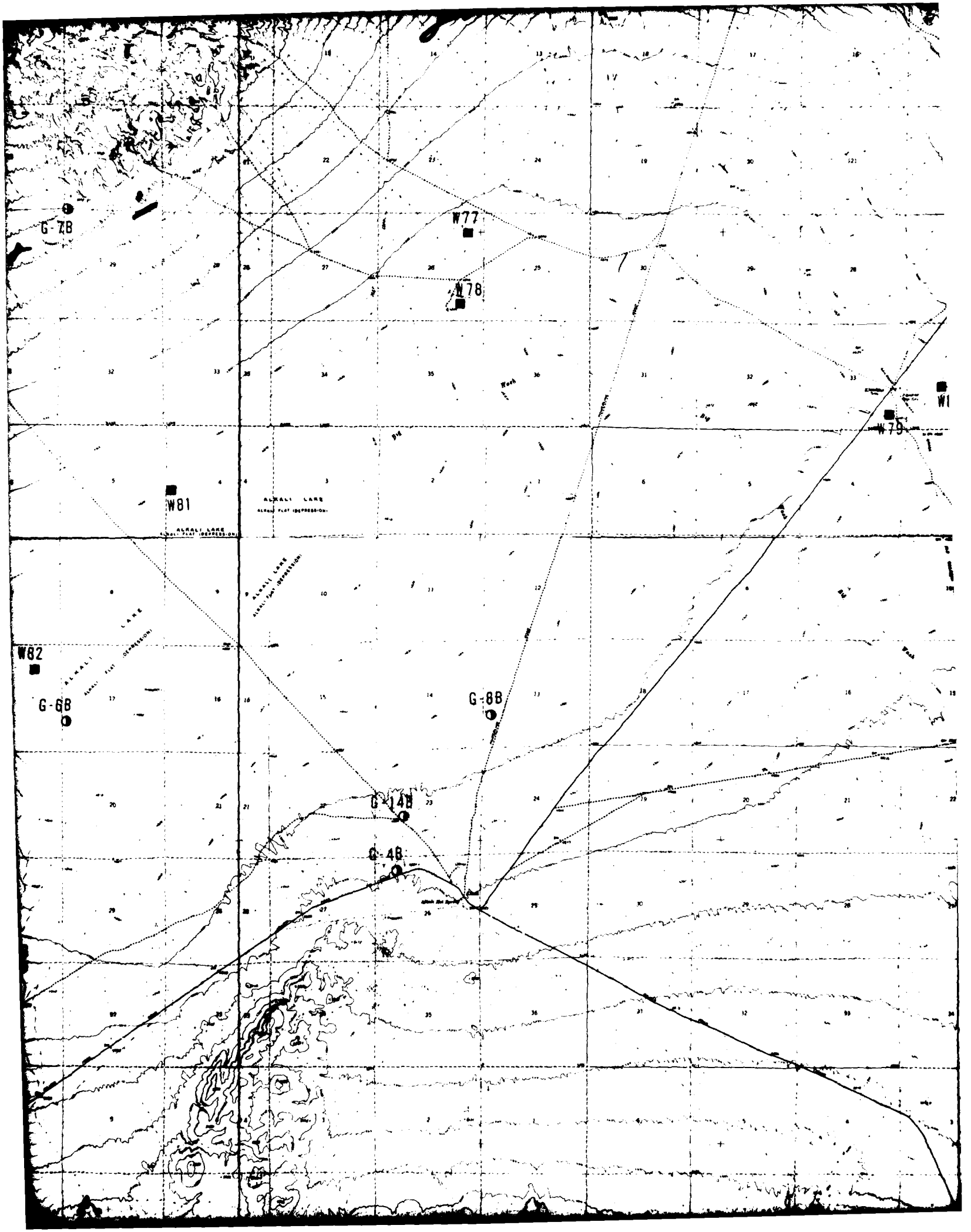

38 00'
C 10
T 9 G 9C
S 3
R 3
Canyon
G 12B
G 14B
C 9
T 5
Ridge Well

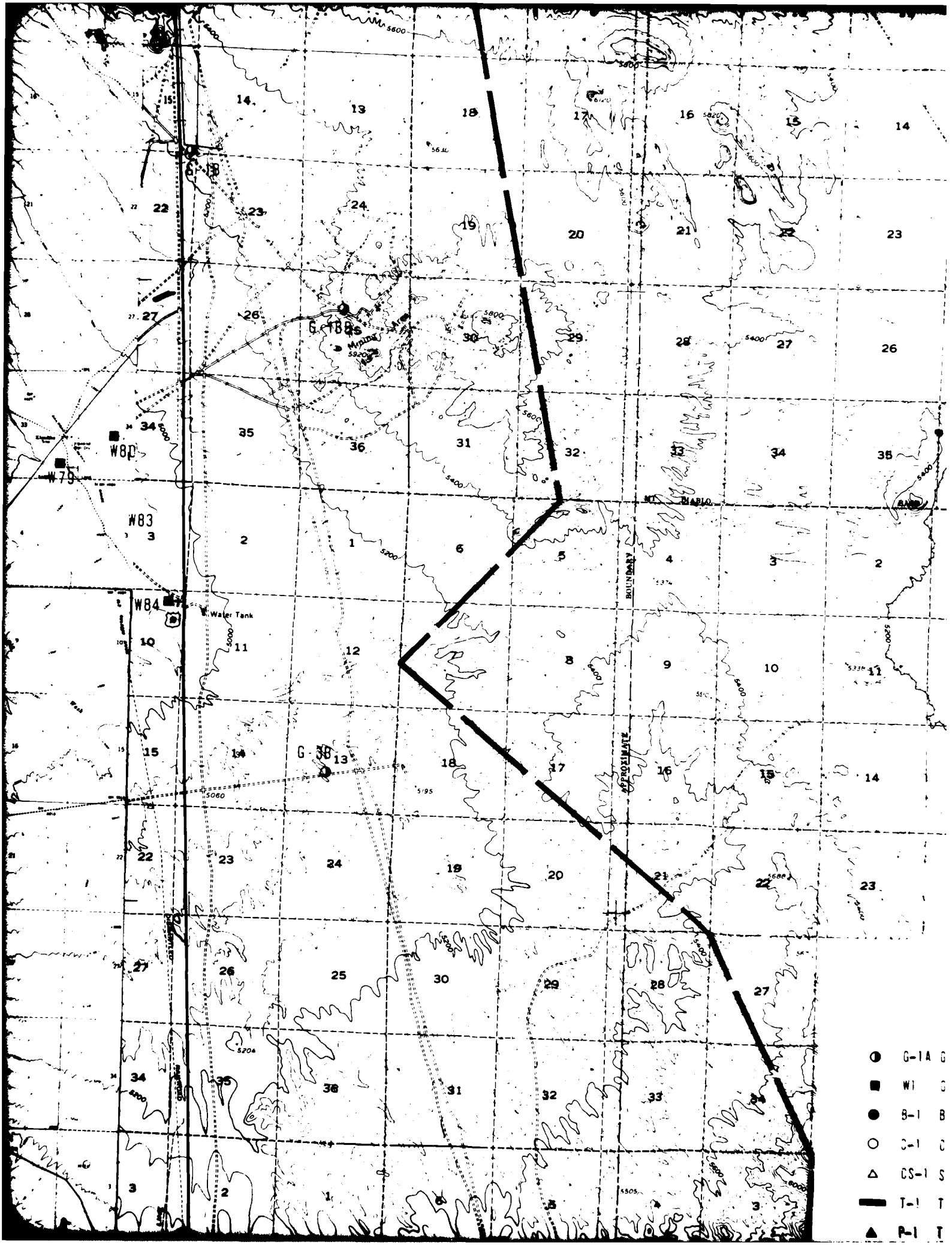

C-2
P-1
S-2
R-2
C-5
CS-5
C-7
CS-7
C-8
P-4
C-4
CS-4
G-9C
G-8C
C-9
G-11B
G-9B
G-10B
G-7B
W77
Montezuma Valley
OLD RAILROAD
BM 5249
BM 5326
BM 5290
BM 5302
BM 5294
BM 5306
BM 5280
BM 5364


Henderson Park
Gold Seam Mine
ESMERALDA CO
NYE CO
TELEPHONE LINE
Targets


19
NYE COUNTY
AIRPORT
BM 5376
38 00'
Targets
NAVAL AIR WEAPONS STATION
FALLON


HILLS
VALLEY
PAYMASTER CANYON
CLAYTON (depression) VALLEY
G-7B
G-13B
W82
G-6B
G-5B
BM 4285
BM 4290
BM 4275
JEEP


G-7B
W77
W78
W81
W82
G-6B
G-8B
G-14B
G-4B
W75
ALKALI LAKE
ALKALI FLAT DEPRESSION


W8D
W79
W83
W84
Water Tank
G-18s
G-3B
MT. DIABLO
BOUNDARY
G-1A G
W1 G
B-1 B
C-1 C
CS-1 S
T-1 T
P-1 T

AD-A113 330 FUGRO NATIONAL INC LONG BEACH CA F/G 8/13
MX SITING INVESTIGATION. GEOTECHNICAL EVALUATION. VOLUME VIII. --ETC(U)
AUG 79 F04704-80-C-0006
UNCLASSIFIED FN-TR-27-8 NL

END
DATE FILMED
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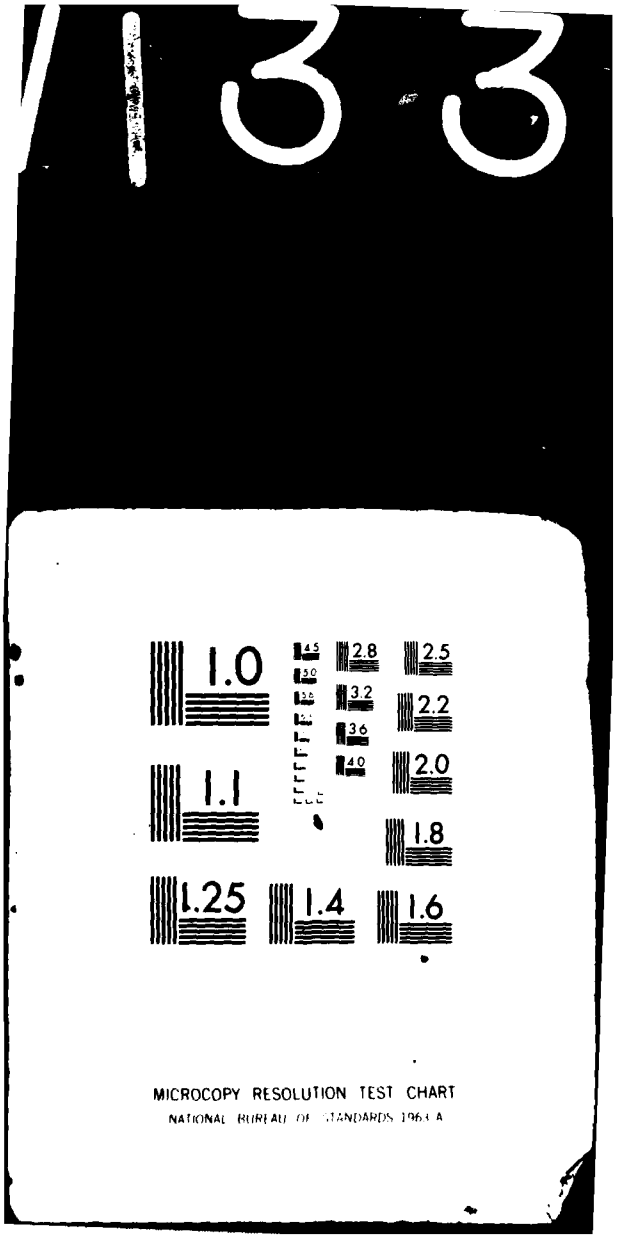
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2.2
2.5
2.8
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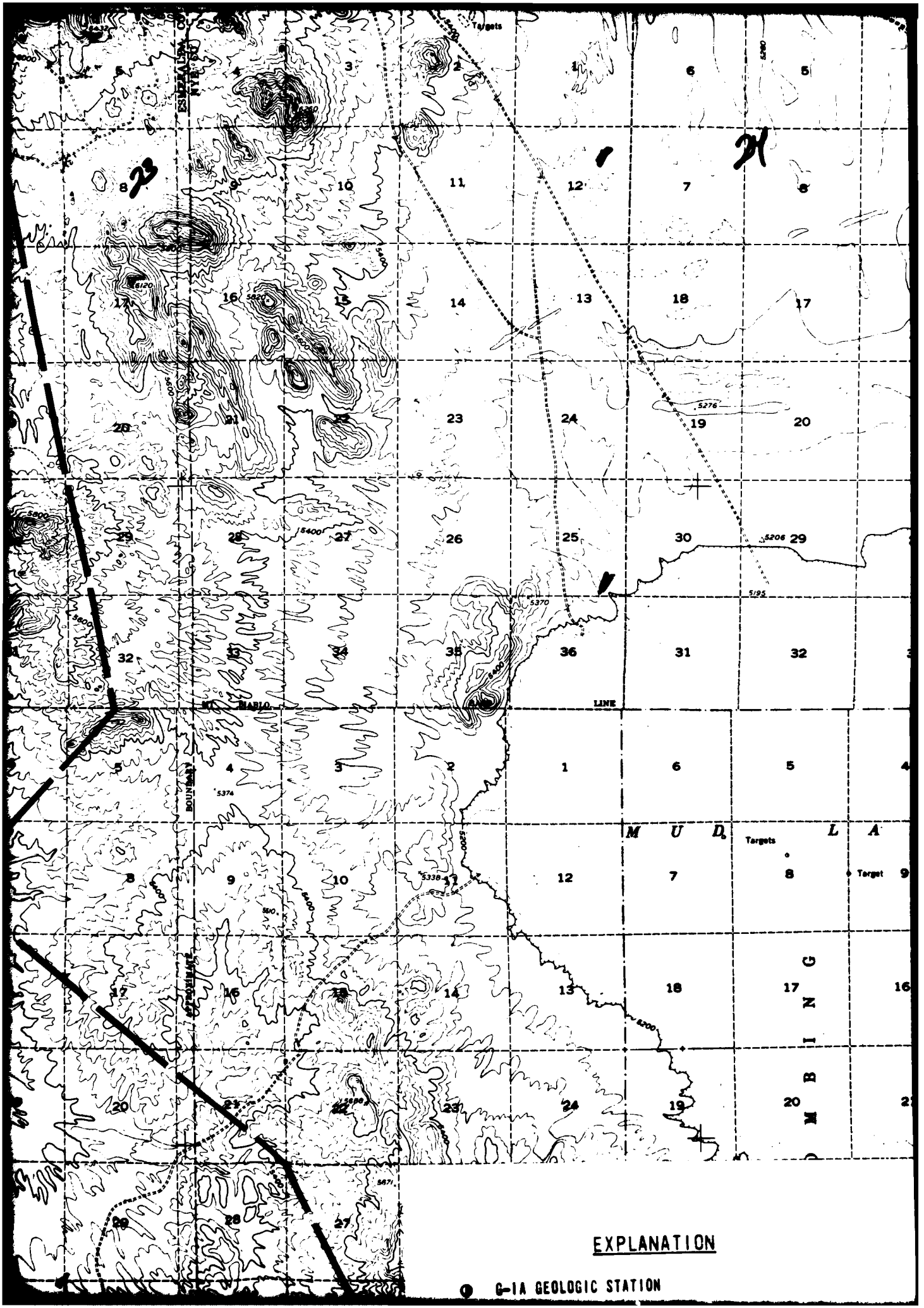
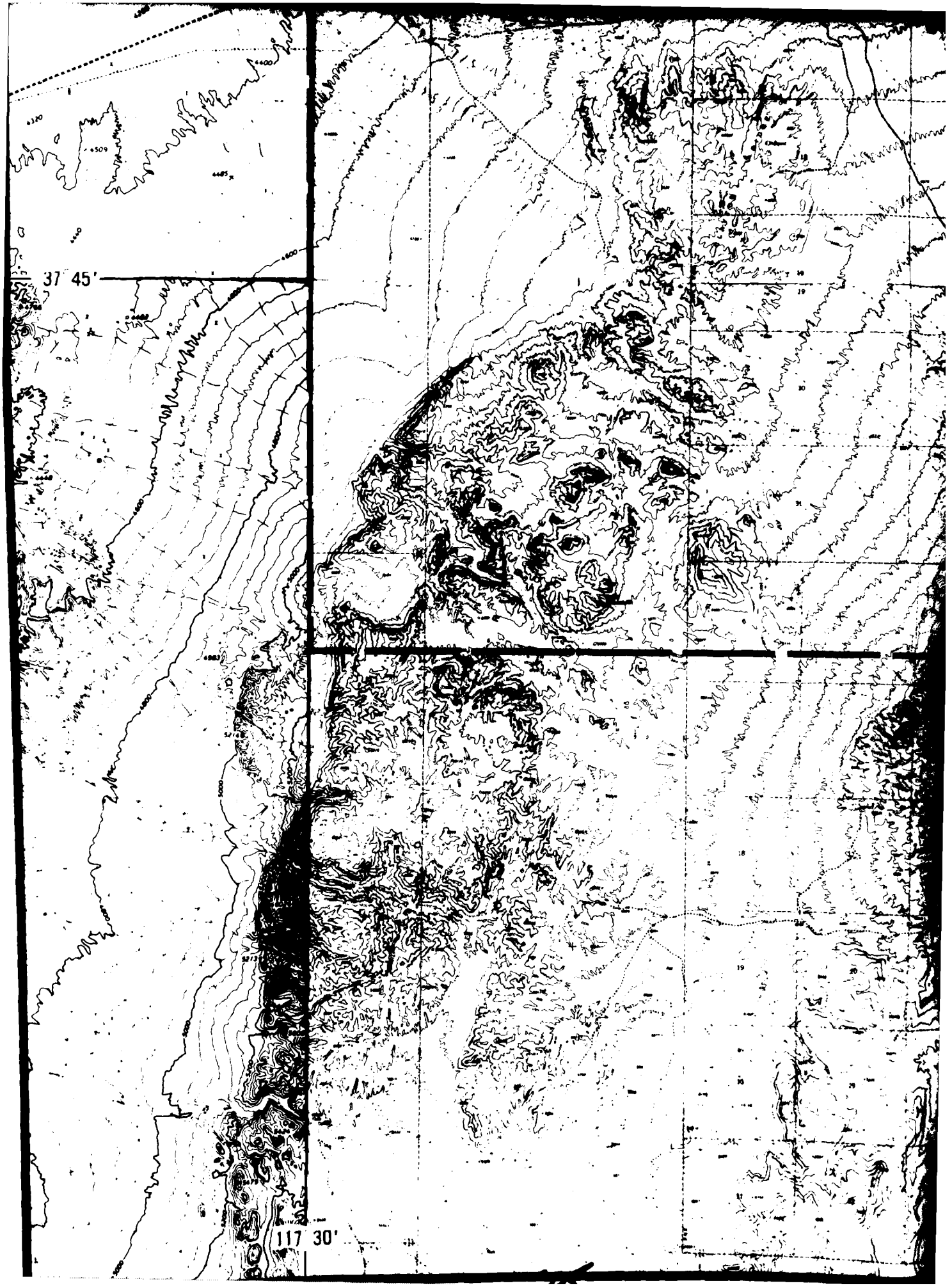
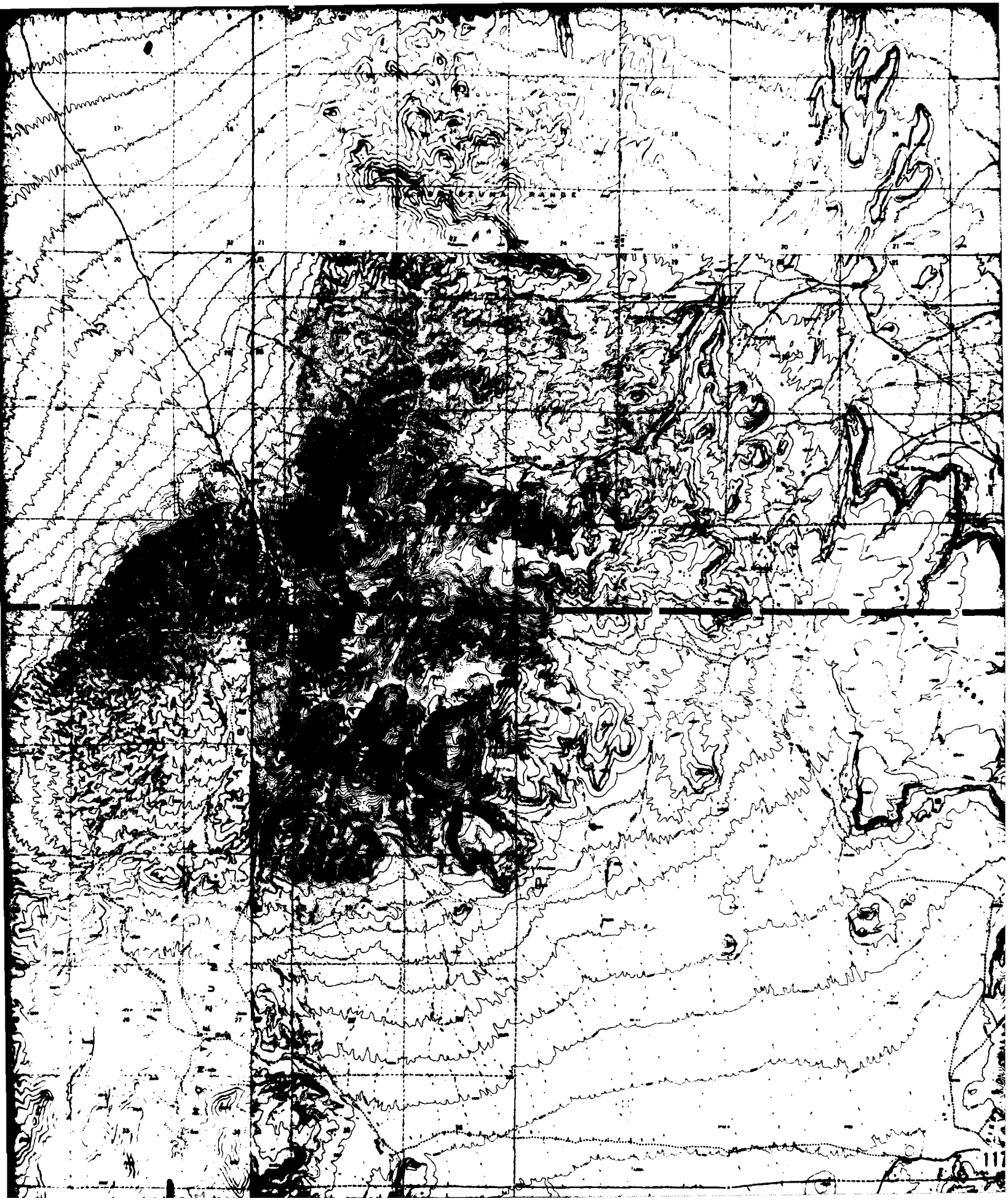
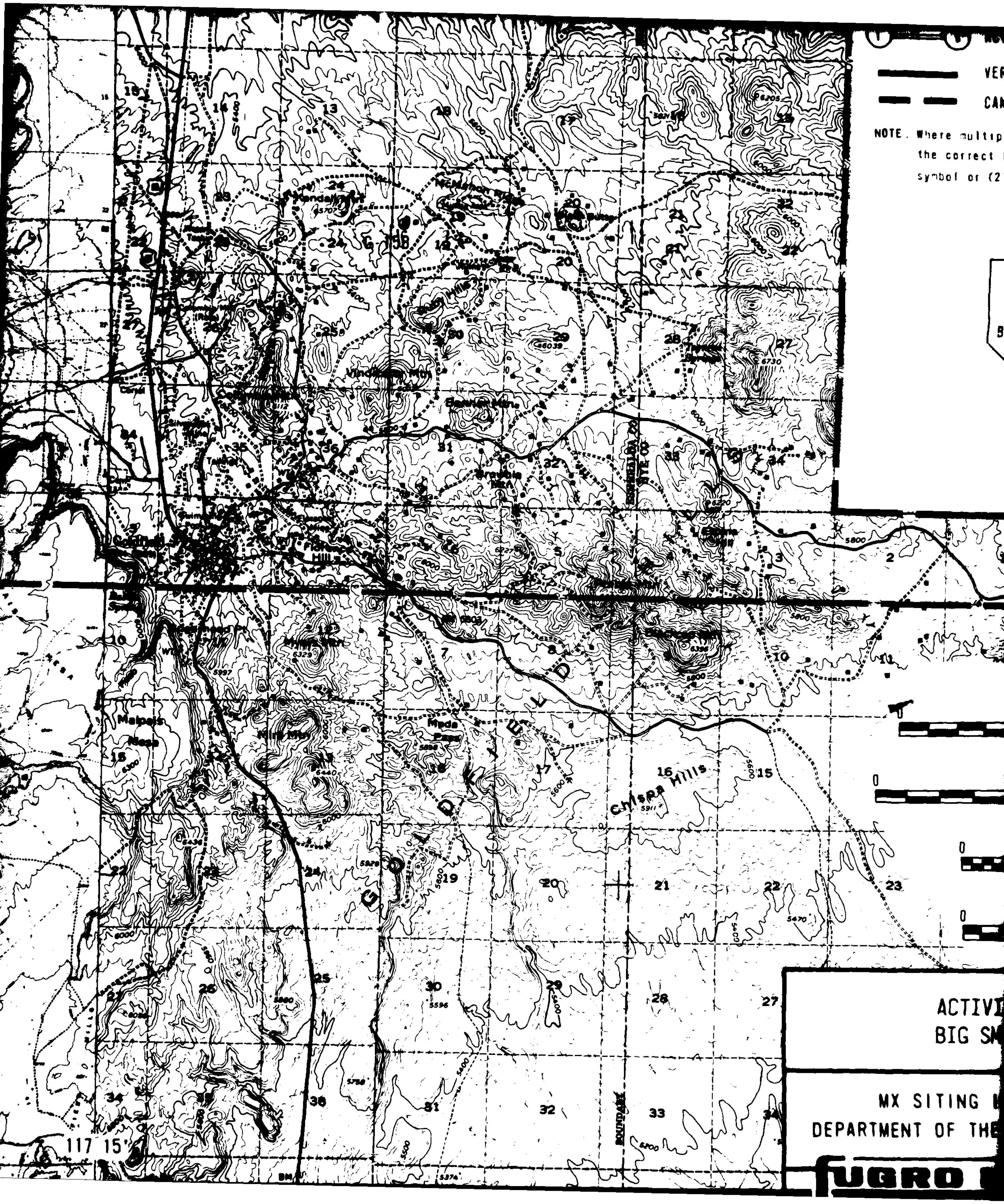
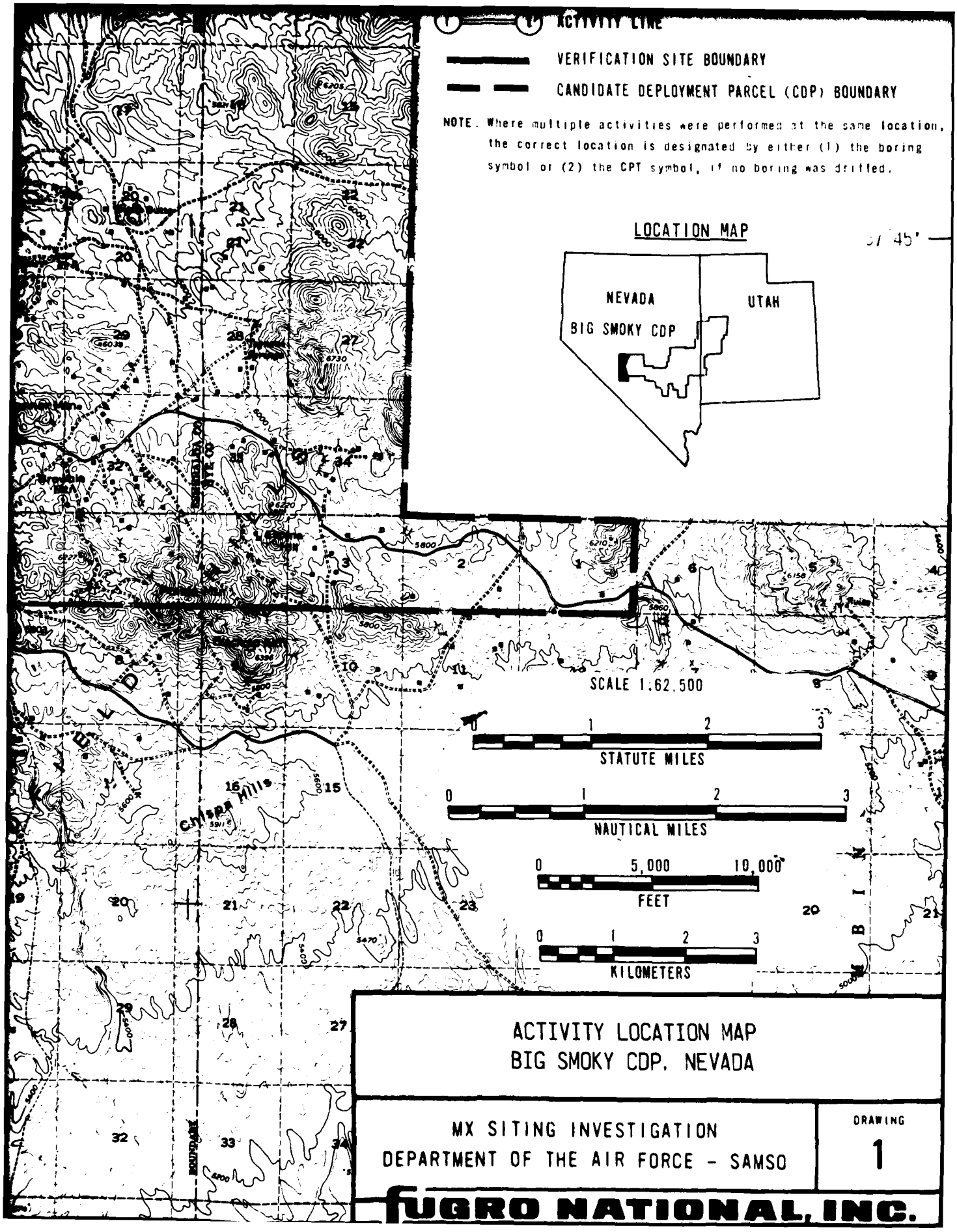
3.6
4.0
4.5
5.0
MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS 1963 A


Targets
MUD
LAKE
Target
LINE
EXPLANATION
G-1A GEOLOGIC STATION


37° 45'
117° 30'




VERIF
CAND
NOTE. Where multiple
the correct lo
symbol or (2)
McMahon Ridge
Kendall Hill
Windmill Mtn
Beaver Mtn
Malpais Mesa
Mesa Pass
Chispa Hills
GOLDFIELD
117 15'
BOUNDARY
ACTIVI
BIG S
MX SITING
DEPARTMENT OF THE
FUGRO



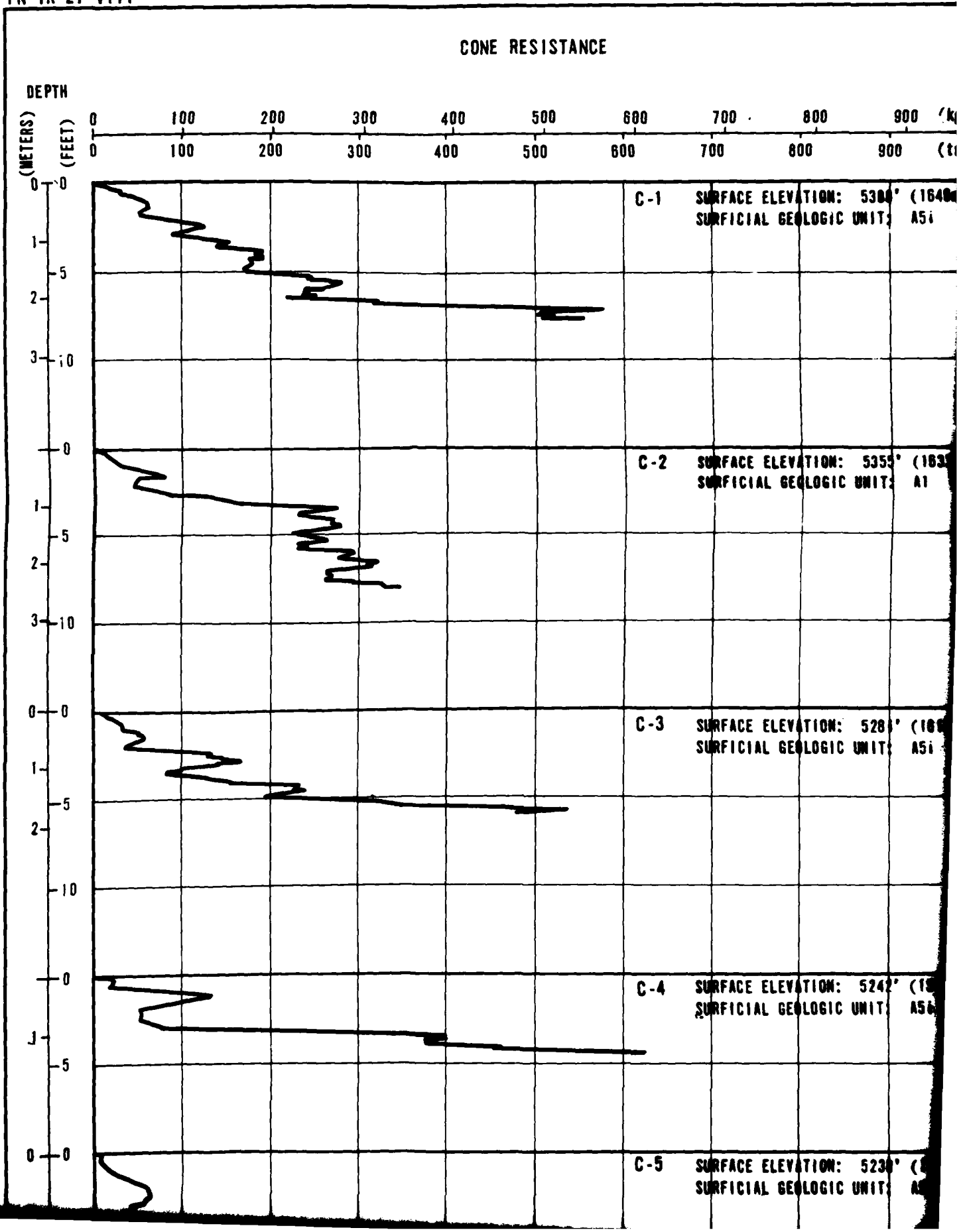
ACTIVITY LOCATION MAP
BIG SMOKY CDP, NEVADA

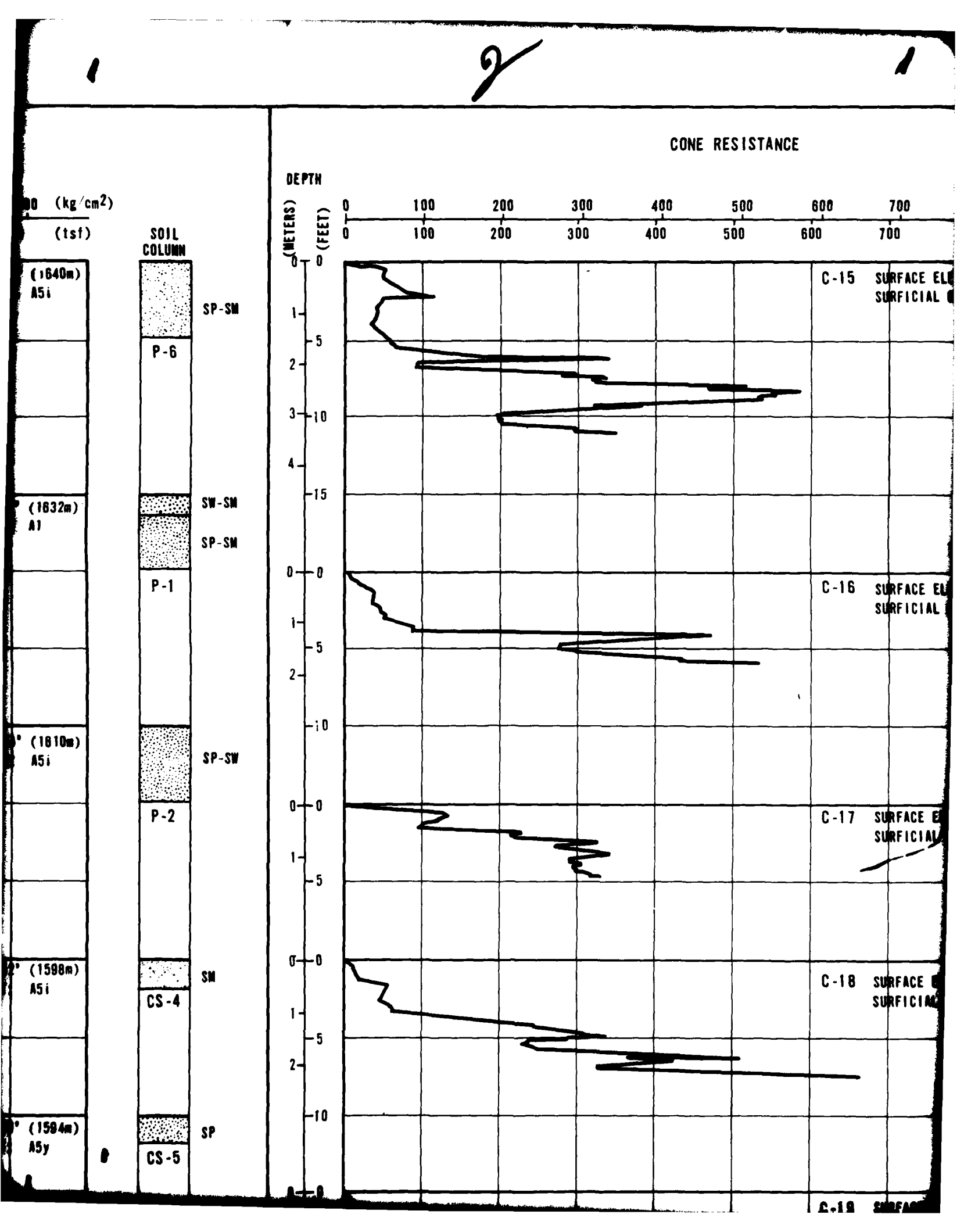
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

DRAWING
1

FUGRO NATIONAL, INC.

FN-TR-27-VIII


CONE RESISTANCE
DEPTH
(METERS)
(FEET)
0 100 200 300 400 500 600 700 800 900
0 100 200 300 400 500 600 700 800 900
C-1 SURFACE ELEVATION: 5380'
SURFICIAL GEOLOGIC UNIT: A5i
C-2 SURFACE ELEVATION: 5355'
SURFICIAL GEOLOGIC UNIT: A1
C-3 SURFACE ELEVATION: 5281'
SURFICIAL GEOLOGIC UNIT: A5i
C-4 SURFACE ELEVATION: 5242'
SURFICIAL GEOLOGIC UNIT: A5i
C-5 SURFACE ELEVATION: 5230'
SURFICIAL GEOLOGIC UNIT:


CONE RESISTANCE
DEPTH
(METERS)
(FEET)
0 100 200 300 400 500 600 700
(kg/cm2)
(tsf)
SOIL COLUMN
(1640m)
A5i
SP-SM
P-6
(1632m)
A1
SW-SM
SP-SM
P-1
(1610m)
A5i
SP-SW
P-2
(1598m)
A5i
SM
CS-4
(1584m)
A5y
SP
CS-5
C-15
C-16
C-17
C-18

RESISTANCE

500 600 700 800 900 (kg/cm²)

500 600 700 800 900 (tsf)

C-15 SURFACE ELEVATION: 4990' (1521m)
SURFICIAL GEOLOGIC UNIT: A1

C-16 SURFACE ELEVATION: 4974' (1516m)
SURFICIAL GEOLOGIC UNIT: A5y

C-17 SURFACE ELEVATION: 4942' (1506m)
SURFICIAL GEOLOGIC UNIT: A5y

C-18 SURFACE ELEVATION: 4920' (1500m)
SURFICIAL GEOLOGIC UNIT: A5y

SOIL COLUMN

SP
CS-15
SP-SM
CS-16
SM
SP
P-8
SP-SM
CS-18

DEPTH

(METERS) (FEET)

0 100 200 300

0 100 200 300

0 1 5 0 0 1 5 0 0 1 5 0 0 1 5 2 10 0 0 1 5 2 0 0 1

CONE RESISTANCE

200 300 400 500 600 700 800 900 (kg/cm^2)

200 300 400 500 600 700 800 900 (tsf)

C-28 SURFACE ELEVATION: 4925' (1501m)
SURFICIAL GEOLOGIC UNIT: A5y/A3

C-29 SURFACE ELEVATION: 4870' (1484m)
SURFICIAL GEOLOGIC UNIT: A5y/A4

C-30 SURFACE ELEVATION: 4878' (1487m)
SURFICIAL GEOLOGIC UNIT: A5y/A3

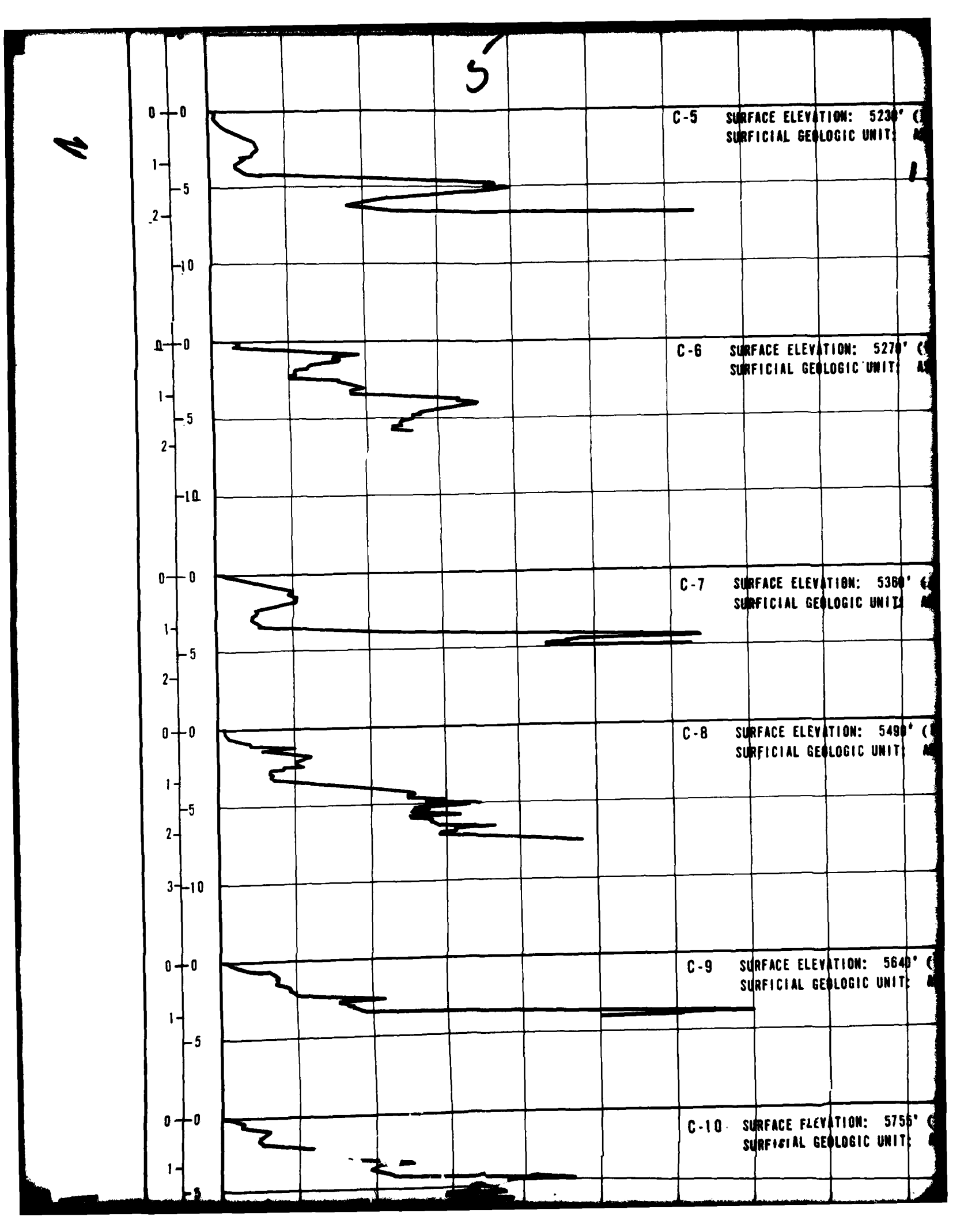
C-31 SURFACE ELEVATION: 4886' (1489m)
SURFICIAL GEOLOGIC UNIT: A5y/A3

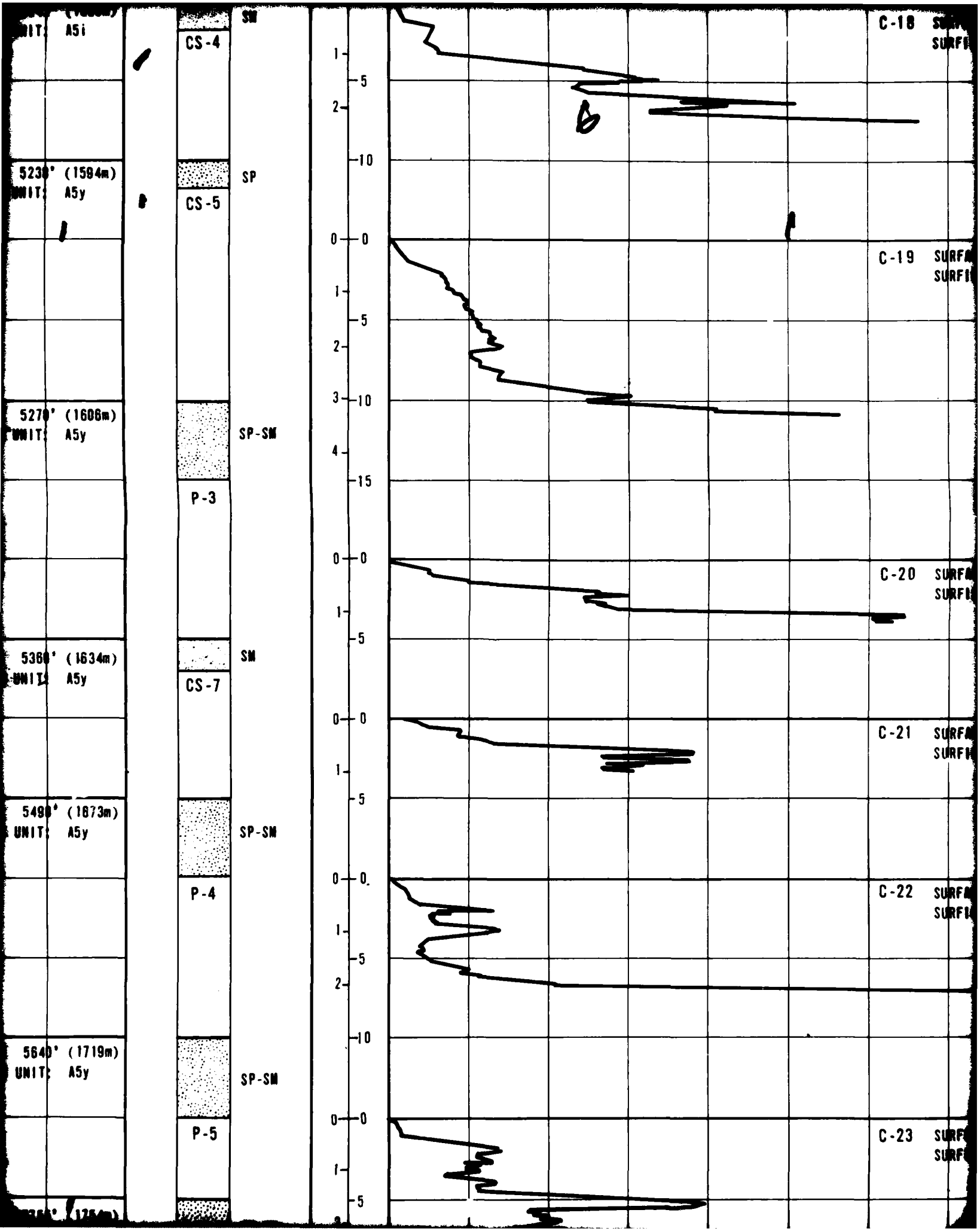
C-32 SURFACE ELEVATION: 4892' (1491m)
SURFICIAL GEOLOGIC UNIT: A5y/A3

C-33 SURFACE ELEVATION: 4922' (1500m)
SURFICIAL GEOLOGIC UNIT: A5y A3

SOIL COLUMN

SM
CS-28
SP-SM
CS-29
SP-SM
CS-30
SP
CS-31
SP-SM
GP
T-3
SM
SW-SM
F-6


C-5 SURFACE ELEVATION: 5230'
SURFICIAL GEOLOGIC UNIT:
C-6 SURFACE ELEVATION: 5270'
SURFICIAL GEOLOGIC UNIT:
C-7 SURFACE ELEVATION: 5360'
SURFICIAL GEOLOGIC UNIT:
C-8 SURFACE ELEVATION: 5490'
SURFICIAL GEOLOGIC UNIT:
C-9 SURFACE ELEVATION: 5640'
SURFICIAL GEOLOGIC UNIT:
C-10 SURFACE ELEVATION: 5755'
SURFICIAL GEOLOGIC UNIT:


UNIT: A5i
CS-4
SM
5238' (1594m)
UNIT: A5y
CS-5
SP
5278' (1606m)
UNIT: A5y
SP-SM
P-3
5368' (1634m)
UNIT: A5y
CS-7
SM
5498' (1673m)
UNIT: A5y
SP-SM
P-4
5640' (1719m)
UNIT: A5y
SP-SM
P-5
C-18
C-19
C-20
C-21
C-22
C-23

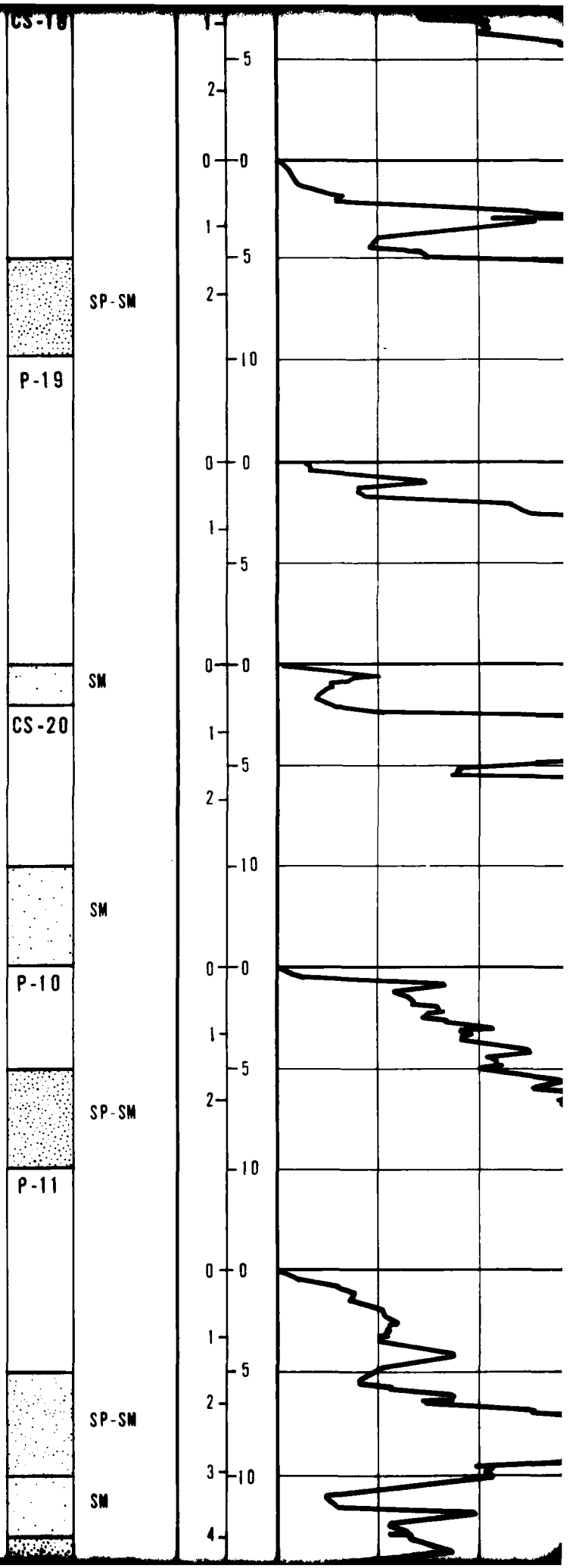
C-19 SURFACE ELEVATION: 4882' (1488m)
SURFICIAL GEOLOGIC UNIT: A5y

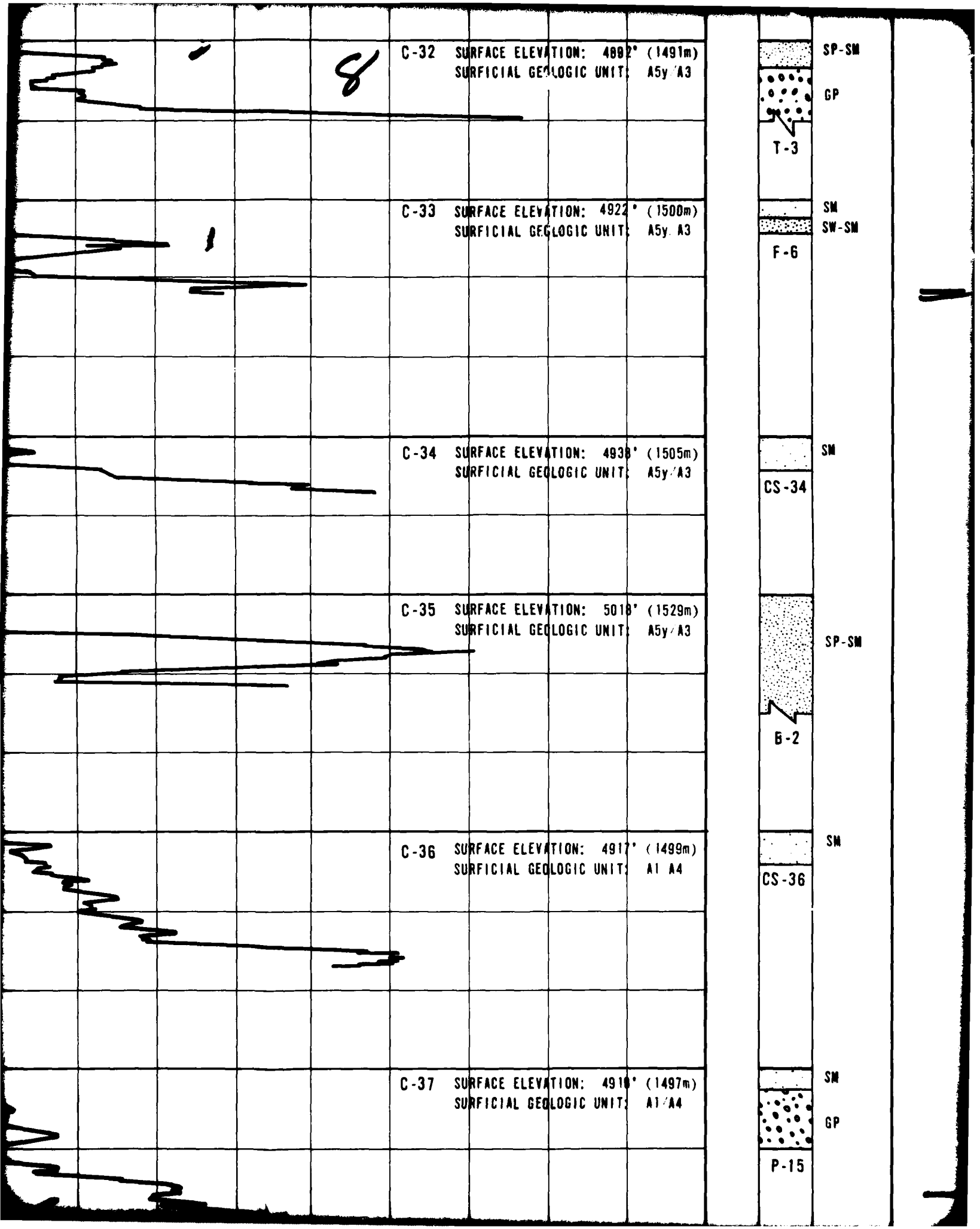
C-20 SURFACE ELEVATION: 4855' (1480m)
SURFICIAL GEOLOGIC UNIT: A5y

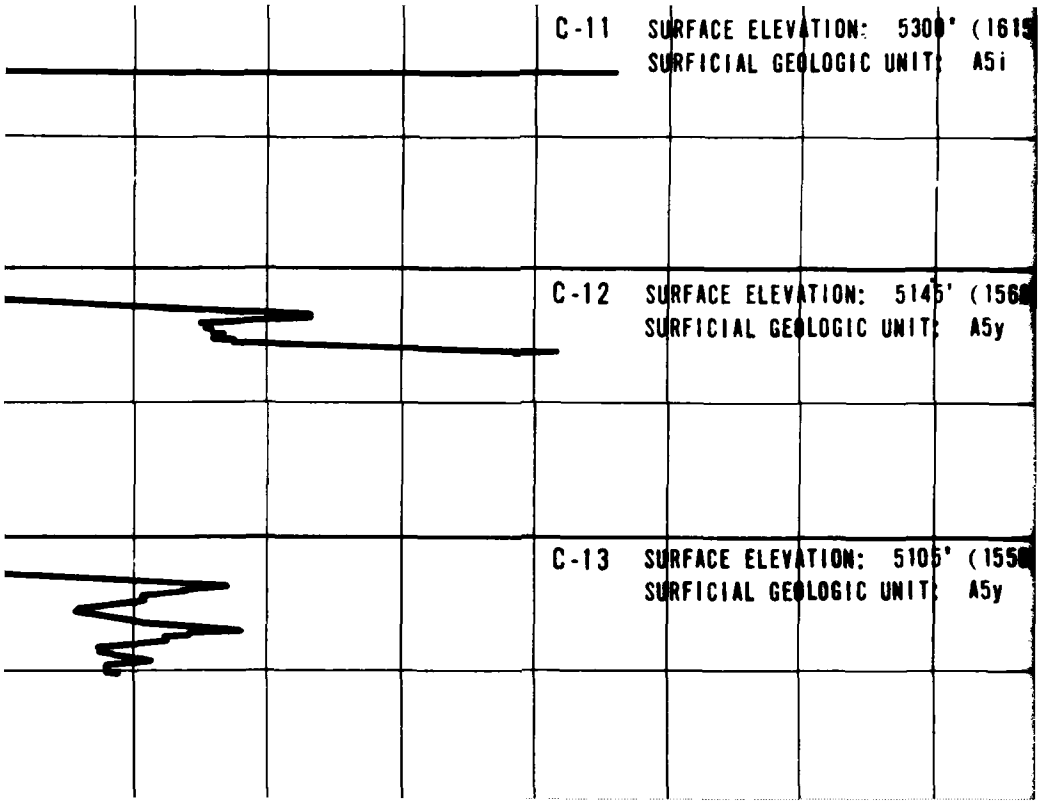
C-21 SURFACE ELEVATION: 5080' (1548m)
SURFICIAL GEOLOGIC UNIT: A5y

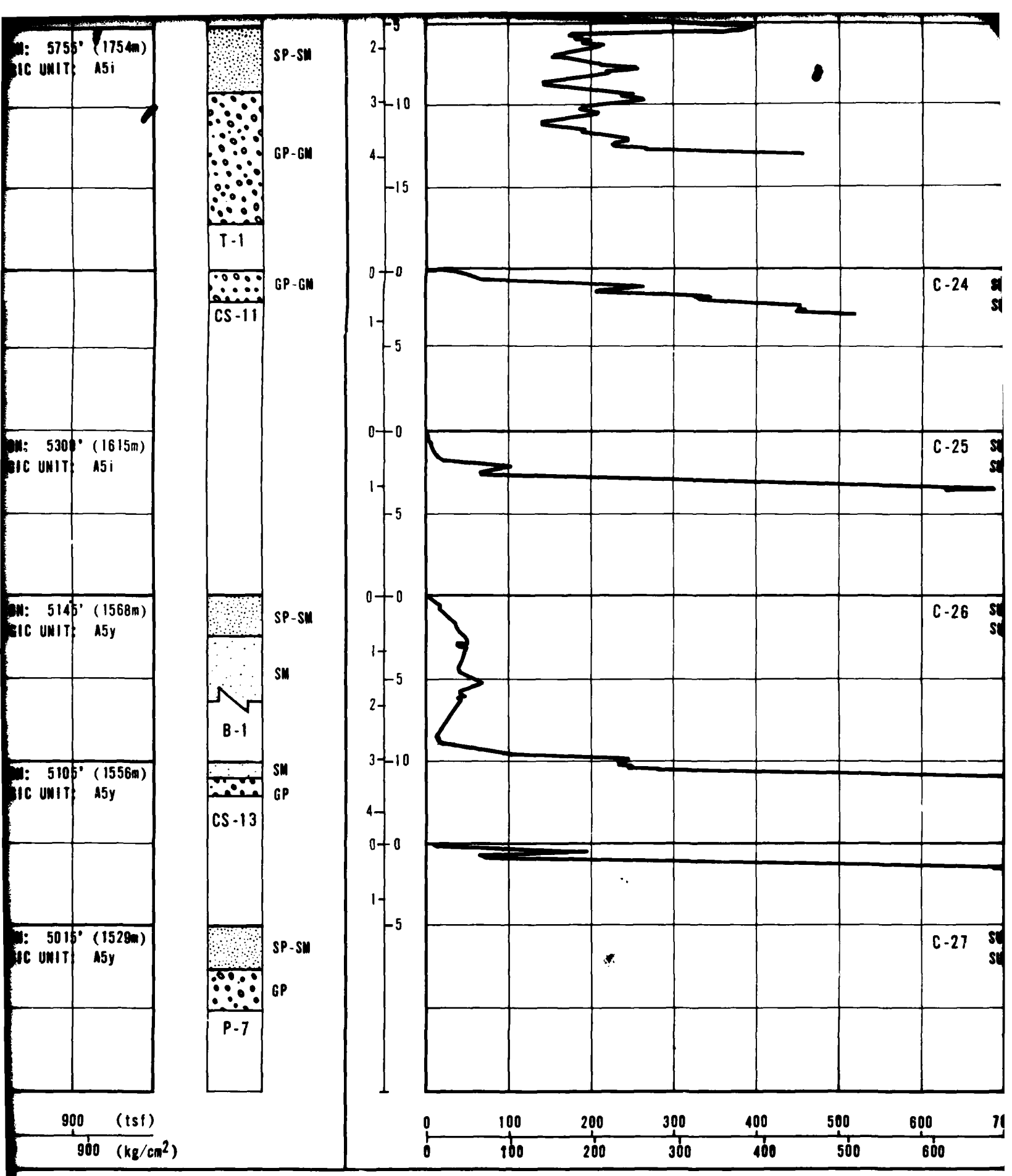
C-22 SURFACE ELEVATION: 4950' (1509m)
SURFICIAL GEOLOGIC UNIT: A5y A3

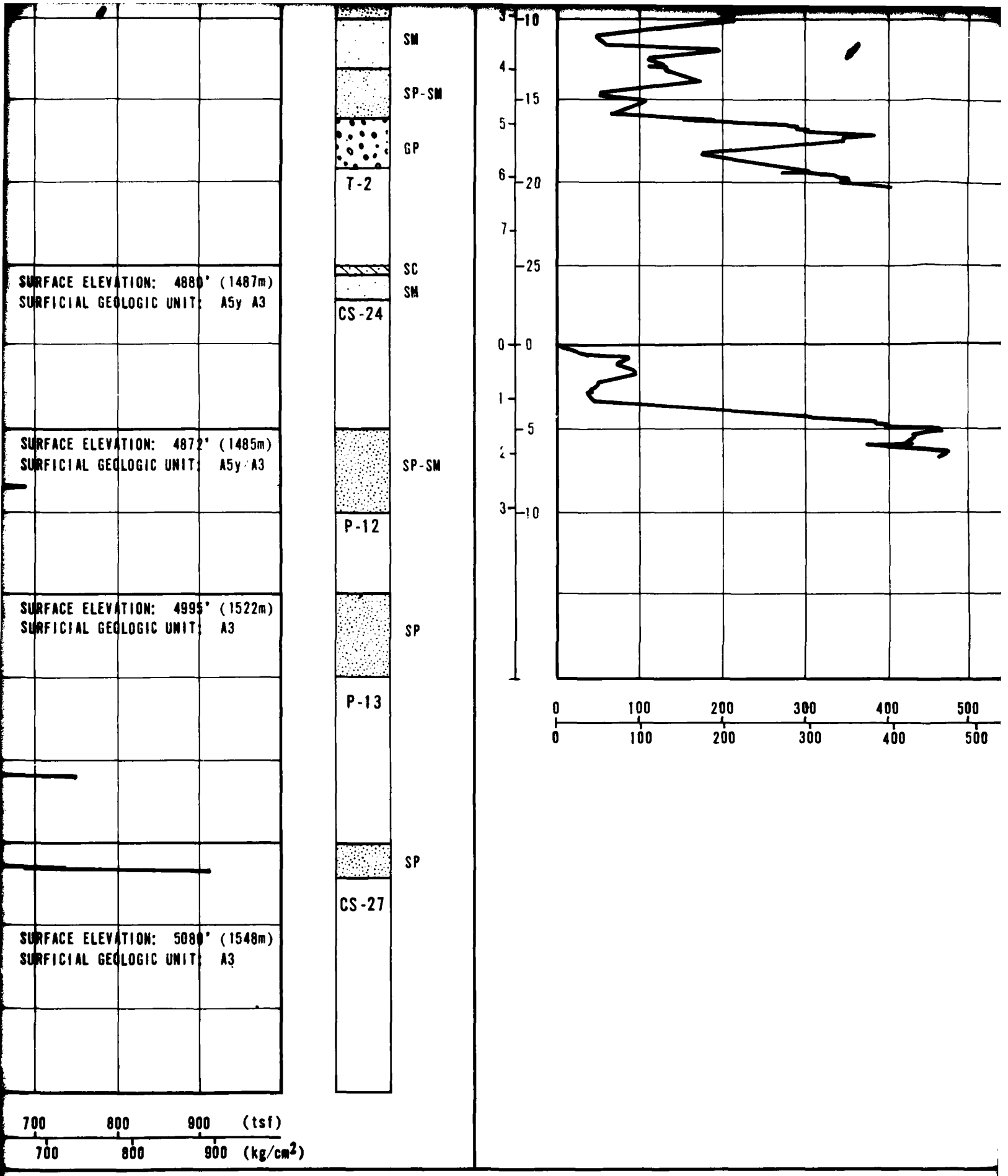
C-23 SURFACE ELEVATION: 5000' (1524m)
SURFICIAL GEOLOGIC UNIT: A5y A3

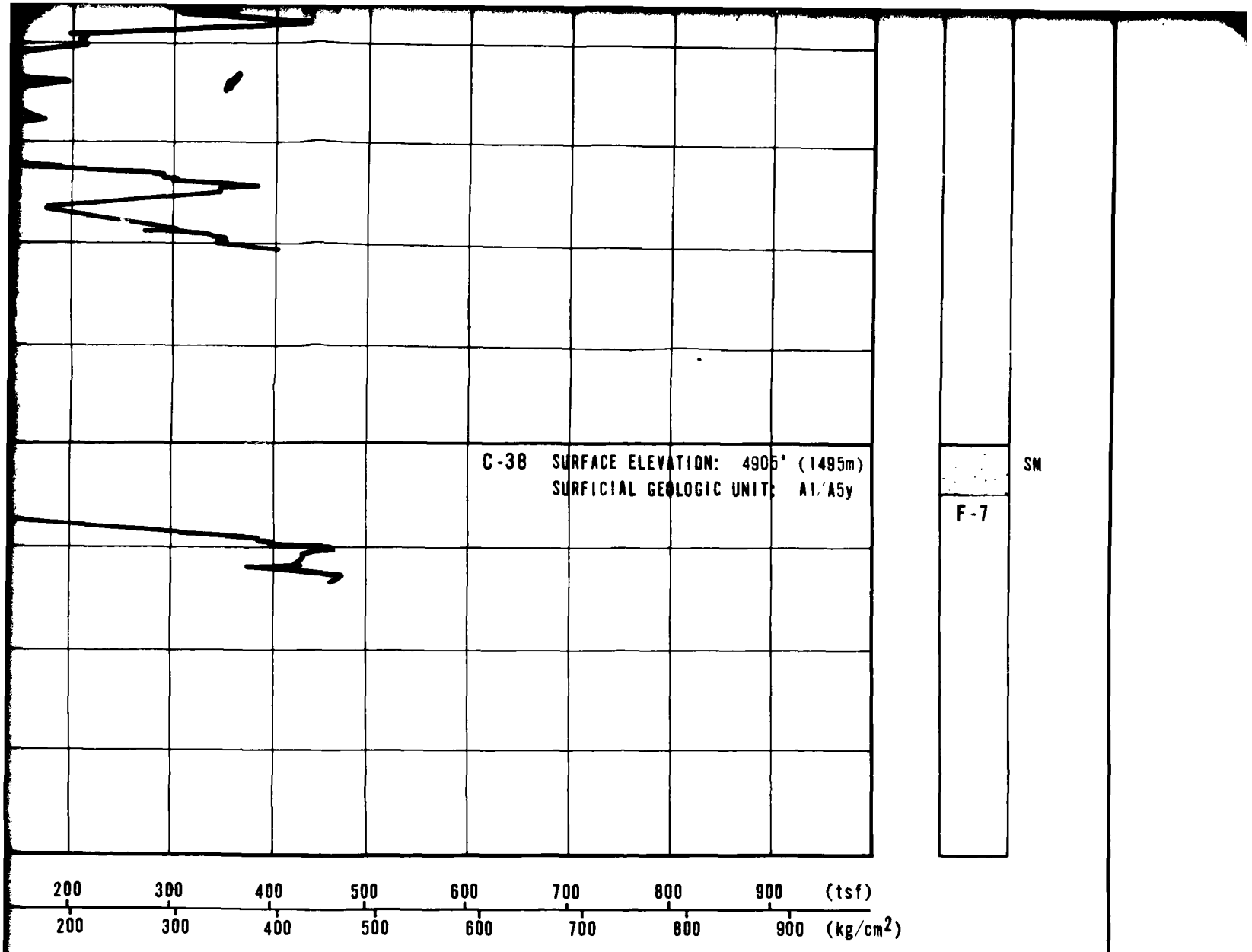



C-32 SURFACE ELEVATION: 4892' (1491m)
SURFICIAL GEOLOGIC UNIT: A5y/A3
SP-SM
GP
T-3
C-33 SURFACE ELEVATION: 4922' (1500m)
SURFICIAL GEOLOGIC UNIT: A5y A3
SM
SW-SM
F-6
C-34 SURFACE ELEVATION: 4938' (1505m)
SURFICIAL GEOLOGIC UNIT: A5y/A3
SM
CS-34
C-35 SURFACE ELEVATION: 5018' (1529m)
SURFICIAL GEOLOGIC UNIT: A5y/A3
SP-SM
B-2
C-36 SURFACE ELEVATION: 4917' (1499m)
SURFICIAL GEOLOGIC UNIT: A1 A4
SM
CS-36
C-37 SURFACE ELEVATION: 4910' (1497m)
SURFICIAL GEOLOGIC UNIT: A1/A4
SM
GP
P-15


C-11 SURFACE ELEVATION: 5300' (1615
SURFICIAL GEOLOGIC UNIT: A5i
C-12 SURFACE ELEVATION: 5145' (1568
SURFICIAL GEOLOGIC UNIT: A5y
C-13 SURFACE ELEVATION: 5105' (1556
SURFICIAL GEOLOGIC UNIT: A5y


5755' (1754m)
IC UNIT: A5i
5308' (1615m)
IC UNIT: A5i
5145' (1568m)
IC UNIT: A5y
5105' (1556m)
IC UNIT: A5y
5015' (1529m)
IC UNIT: A5y
SP-SM
GP-GM
T-1
GP-GM
CS-11
SP-SM
SM
B-1
SM
GP
CS-13
SP-SM
GP
P-7
C-24
C-25
C-26
C-27
900 (tsf)
900 (kg/cm2)
0 100 200 300 400 500 600


SM
SP-SM
GP
T-2
SC
SM
CS-24
SP-SM
P-12
SP
P-13
SP
CS-27
SURFACE ELEVATION: 4880' (1487m)
SURFICIAL GEOLOGIC UNIT: A5y A3
SURFACE ELEVATION: 4872' (1485m)
SURFICIAL GEOLOGIC UNIT: A5y A3
SURFACE ELEVATION: 4995' (1522m)
SURFICIAL GEOLOGIC UNIT: A3
SURFACE ELEVATION: 5080' (1548m)
SURFICIAL GEOLOGIC UNIT: A3
700 800 900 (tsf)
700 800 900 (kg/cm²)
10
15
20
25
0
5
10
0 100 200 300 400 500
0 100 200 300 400 500



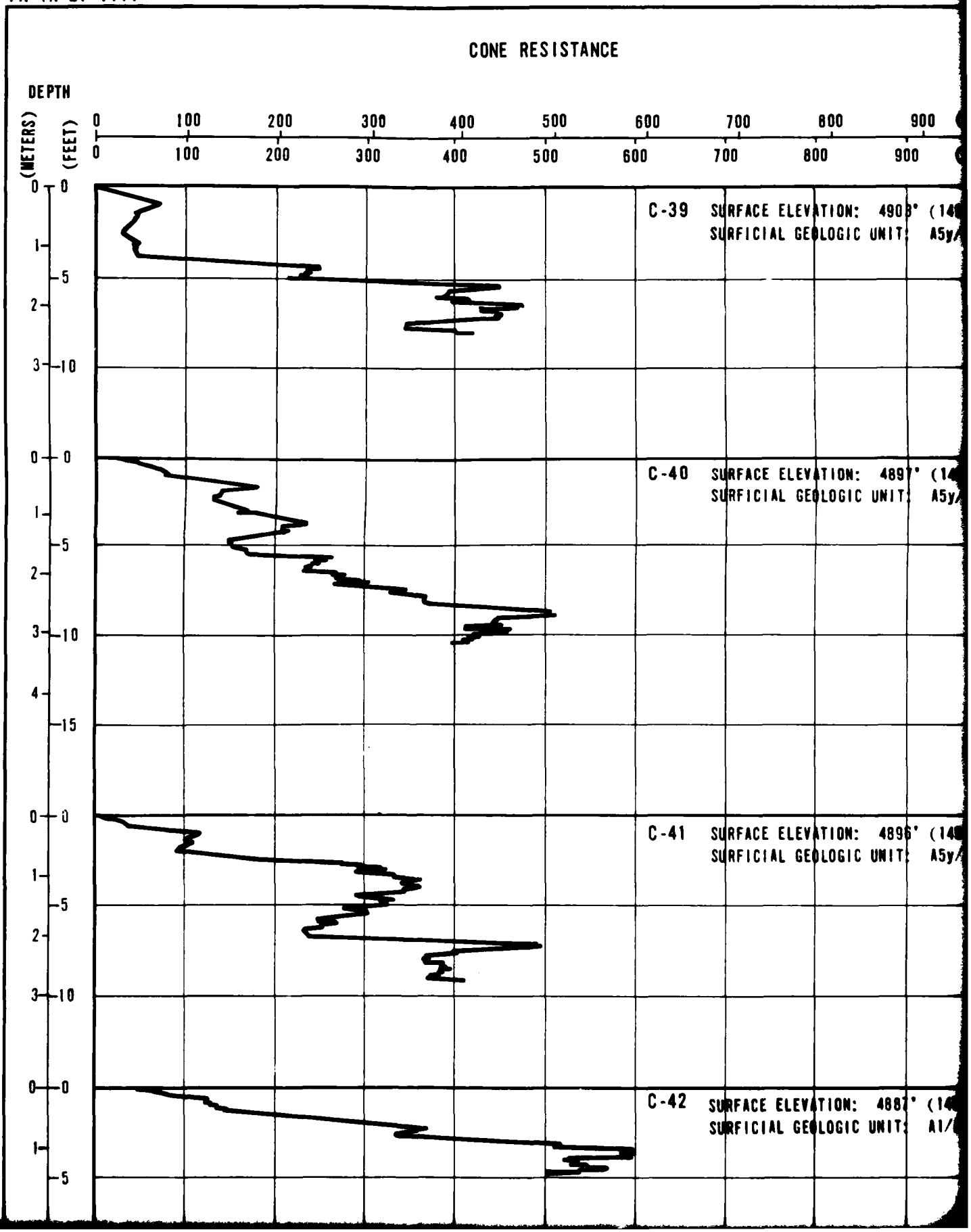
CONE PENETROMETER TEST RESULTS
VERIFICATION SITE
BIG SMOKY COP. NEVADA

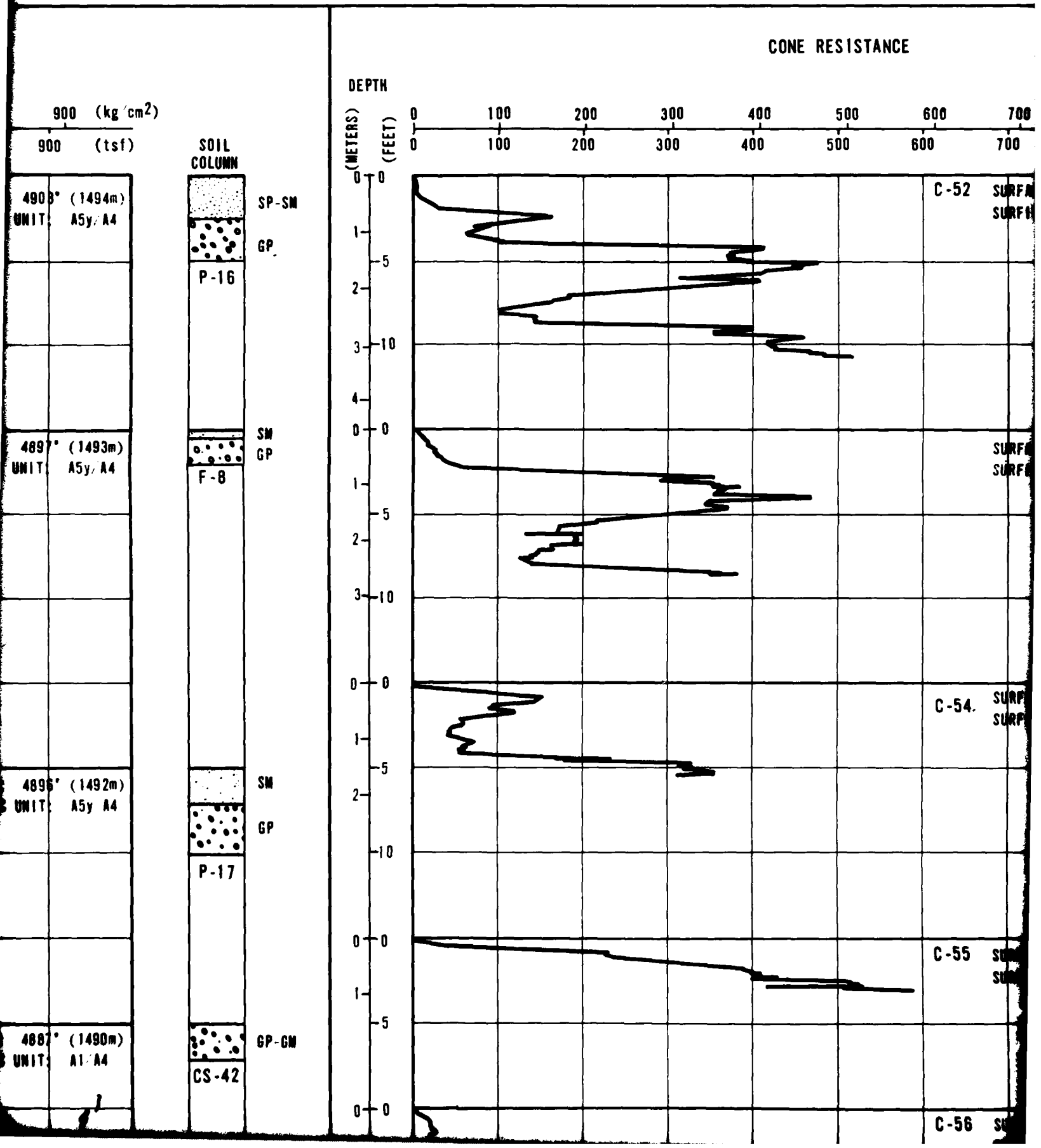
MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

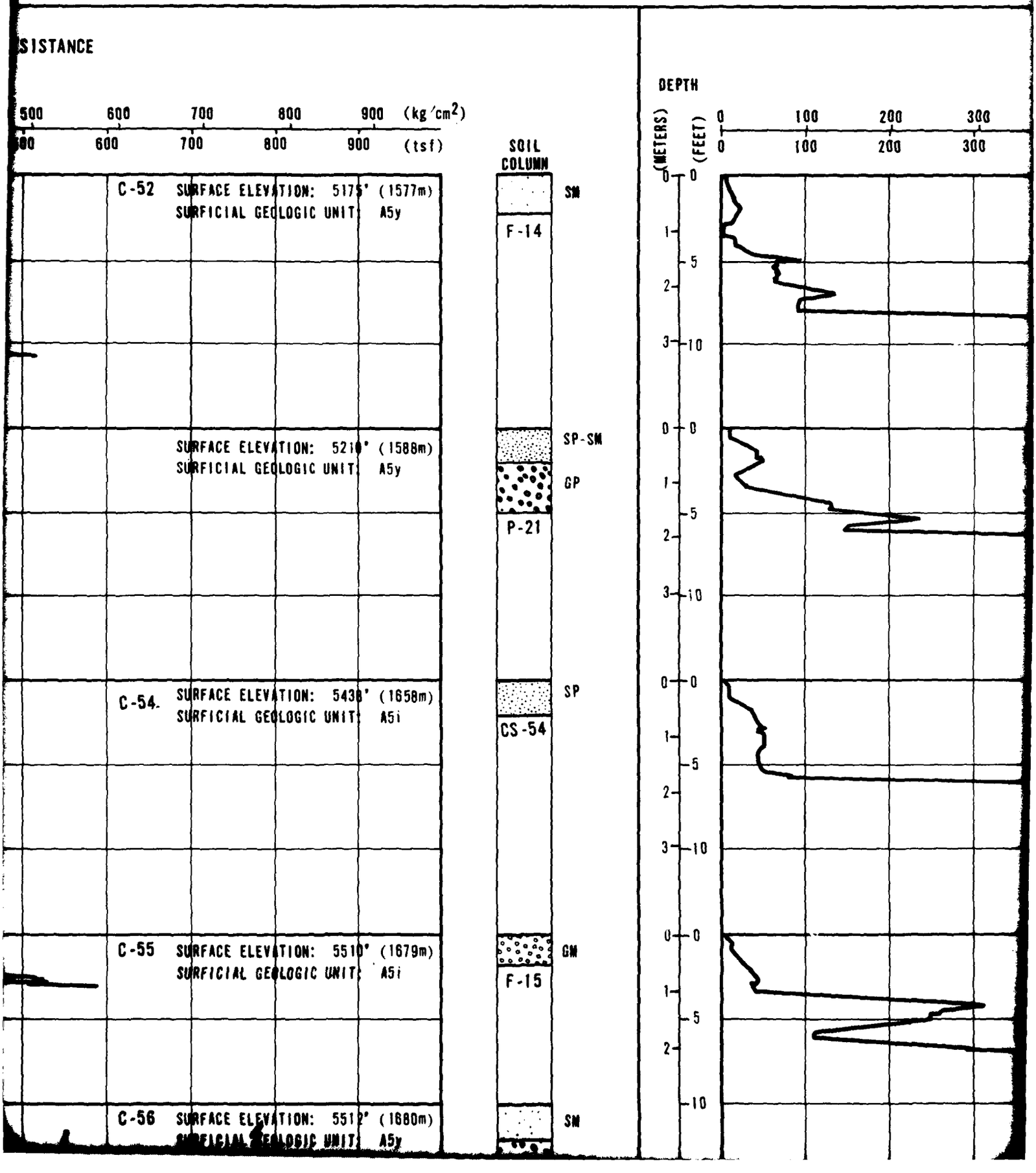
DRAWING
2
1 OF 3

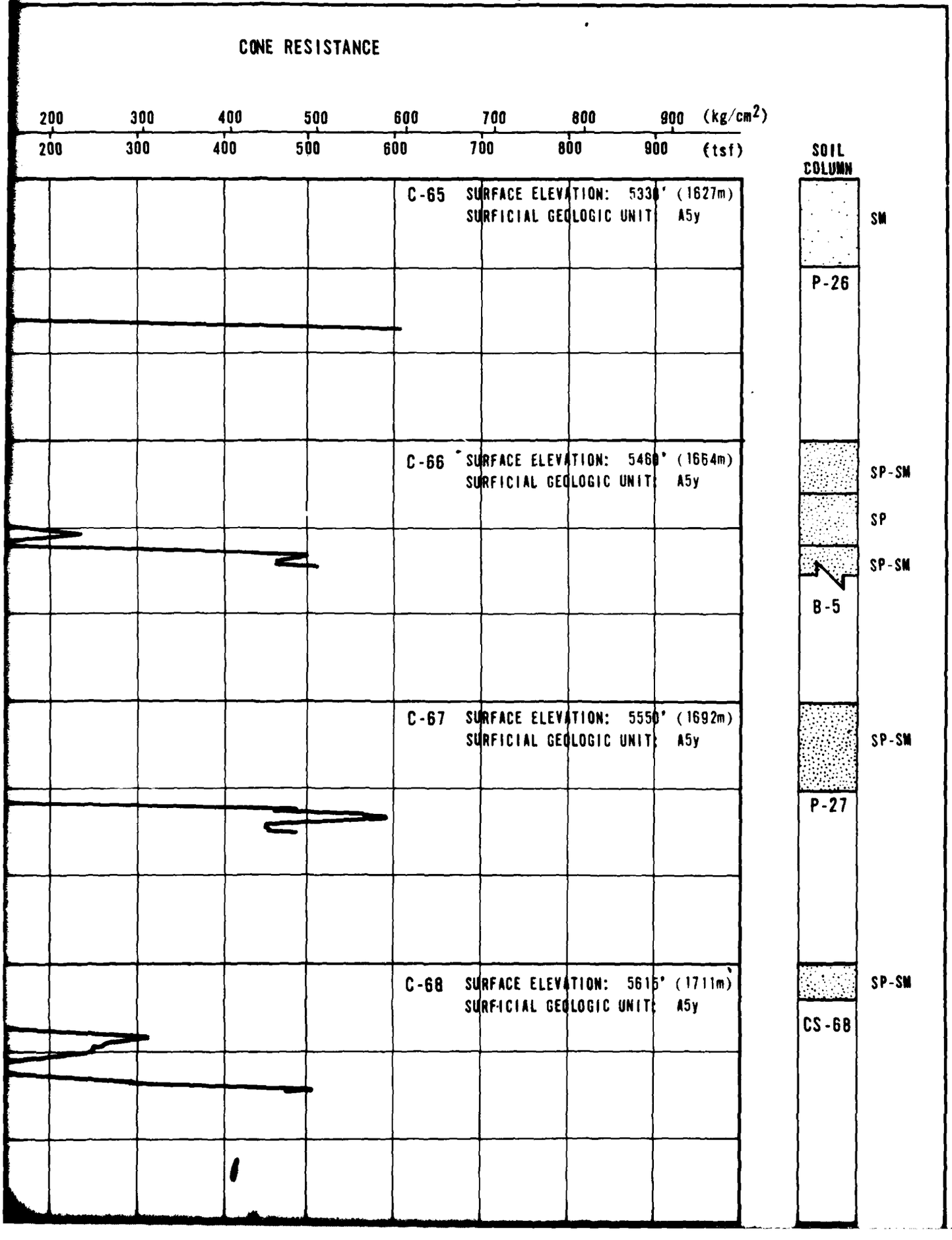
FUGRO NATIONAL, INC.

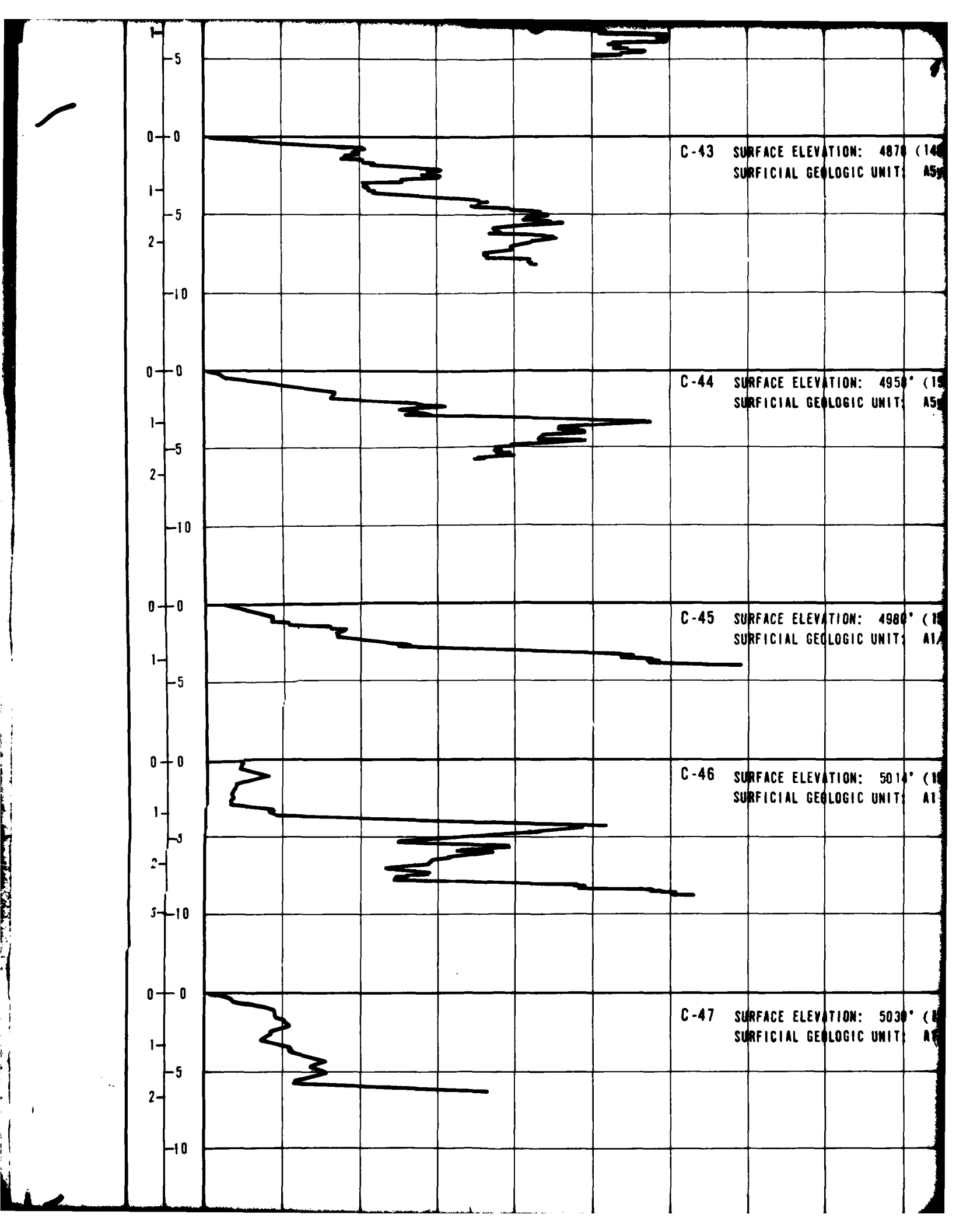
FN-TR-27-VIII

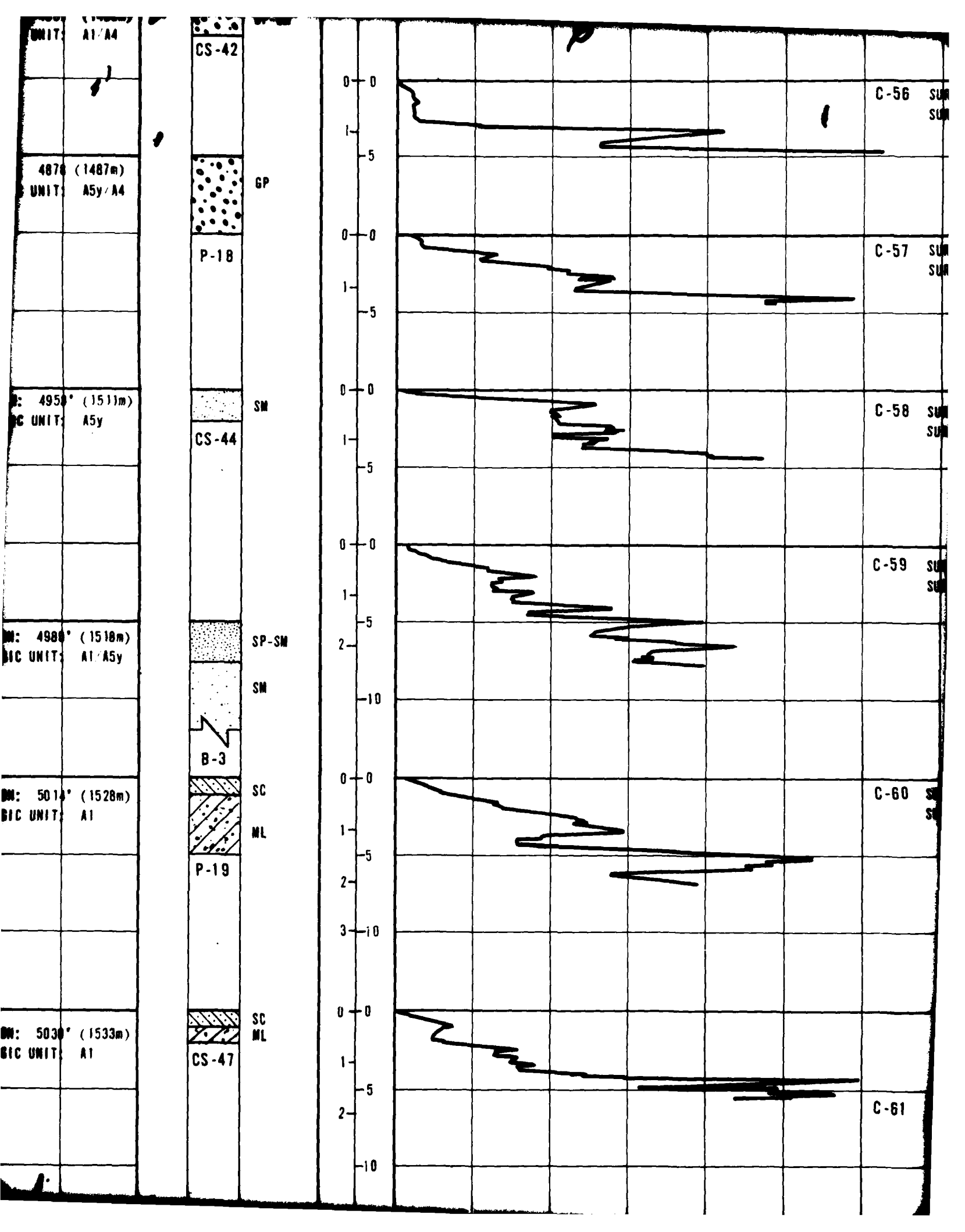

CONE RESISTANCE
DEPTH
(METERS)
(FEET)
0 100 200 300 400 500 600 700 800 900
C-39 SURFACE ELEVATION: 490
SURFICIAL GEOLOGIC UNIT: A5y
C-40 SURFACE ELEVATION: 489
SURFICIAL GEOLOGIC UNIT: A5y
C-41 SURFACE ELEVATION: 489
SURFICIAL GEOLOGIC UNIT: A5y
C-42 SURFACE ELEVATION: 488
SURFICIAL GEOLOGIC UNIT: A1/

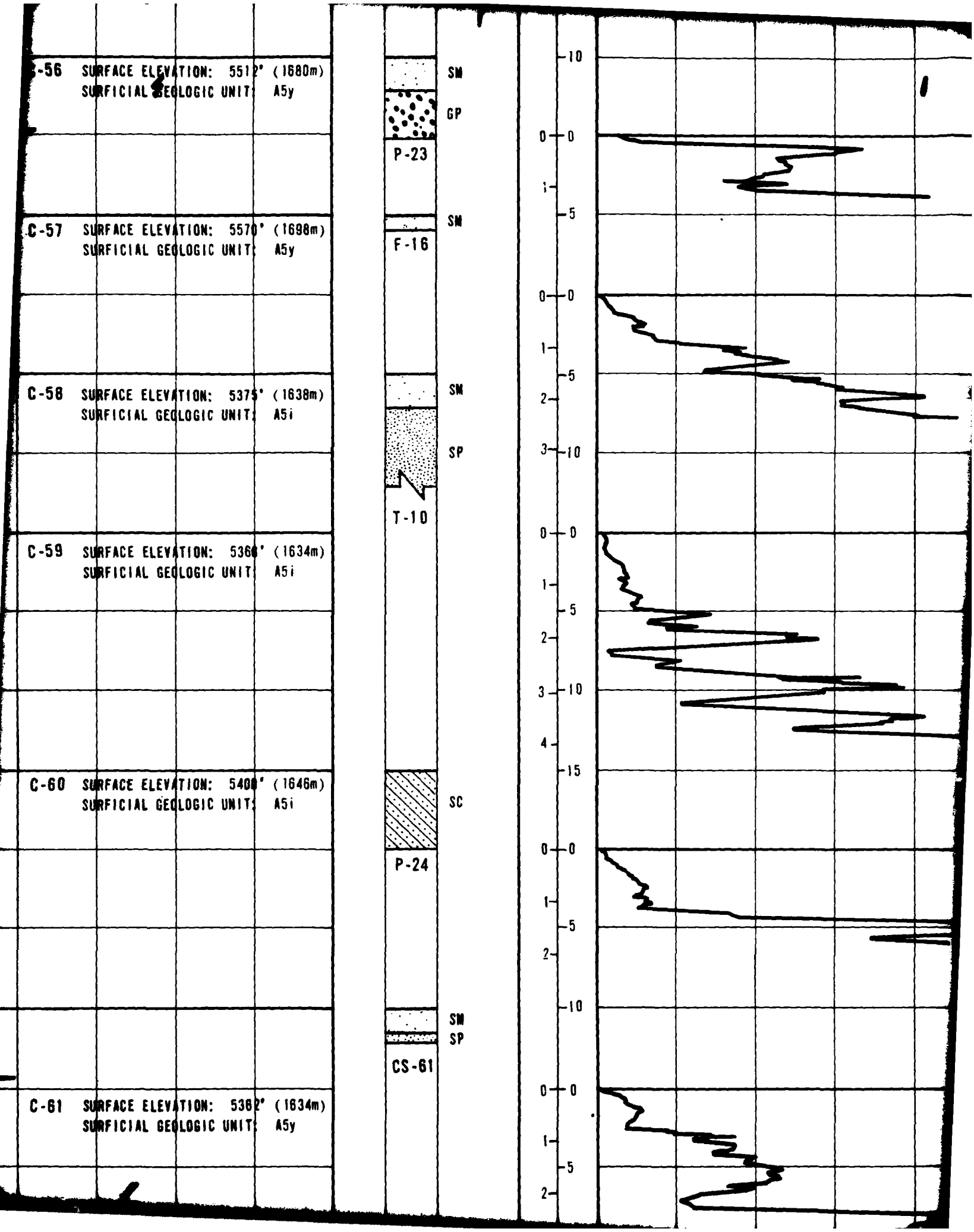

900 (kg/cm2)
900 (tsf)
SOIL COLUMN
4908' (1494m)
UNIT: A5y/A4
SP-SM
GP
P-16
4897' (1493m)
UNIT: A5y/A4
SM
GP
F-8
4896' (1492m)
UNIT: A5y A4
SM
GP
P-17
4887' (1490m)
UNIT: A1/A4
GP-GM
CS-42
CONE RESISTANCE
DEPTH
(METERS)
(FEET)
0 100 200 300 400 500 600 700
C-52
C-54.
C-55
C-56


SISTANCE
500 600 700 800 900 (kg/cm²)
600 700 800 900 (tsf)
C-52 SURFACE ELEVATION: 5175' (1577m)
SURFICIAL GEOLOGIC UNIT: A5y
SURFACE ELEVATION: 5210' (1588m)
SURFICIAL GEOLOGIC UNIT: A5y
C-54. SURFACE ELEVATION: 5438' (1658m)
SURFICIAL GEOLOGIC UNIT: A5i
C-55 SURFACE ELEVATION: 5510' (1679m)
SURFICIAL GEOLOGIC UNIT: A5i
C-56 SURFACE ELEVATION: 5512' (1680m)
SURFICIAL GEOLOGIC UNIT: A5y
SOIL COLUMN
SM
F-14
SP-SM
GP
P-21
SP
CS-54
GM
F-15
SM
DEPTH
(METERS) (FEET)
0 100 200 300
0 100 200 300


CONE RESISTANCE
200 300 400 500 600 700 800 900 (kg/cm²)
200 300 400 500 600 700 800 900 (tsf)
SOIL COLUMN
C-65 SURFACE ELEVATION: 5330' (1627m)
SURFICIAL GEOLOGIC UNIT: A5y
SM
P-26
C-66 SURFACE ELEVATION: 5460' (1664m)
SURFICIAL GEOLOGIC UNIT: A5y
SP-SM
SP
SP-SM
B-5
C-67 SURFACE ELEVATION: 5550' (1692m)
SURFICIAL GEOLOGIC UNIT: A5y
SP-SM
P-27
C-68 SURFACE ELEVATION: 5615' (1711m)
SURFICIAL GEOLOGIC UNIT: A5y
SP-SM
CS-68


C-43 SURFACE ELEVATION: 487
SURFICIAL GEOLOGIC UNIT: A5
C-44 SURFACE ELEVATION: 4950'
SURFICIAL GEOLOGIC UNIT: A5
C-45 SURFACE ELEVATION: 4980'
SURFICIAL GEOLOGIC UNIT: A1
C-46 SURFACE ELEVATION: 5014'
SURFICIAL GEOLOGIC UNIT: A1
C-47 SURFACE ELEVATION: 5030'
SURFICIAL GEOLOGIC UNIT:


UNIT: A1/A4
CS-42
GP
4878 (1487m)
UNIT: A5y/A4
P-18
SM
4958' (1511m)
UNIT: A5y
CS-44
SP-SM
SM
4988' (1518m)
UNIT: A1/A5y
B-3
SC
ML
5014' (1528m)
UNIT: A1
P-19
SC
ML
5038' (1533m)
UNIT: A1
CS-47
C-56
C-57
C-58
C-59
C-60
C-61


C-56 SURFACE ELEVATION: 5512' (1680m)
SURFICIAL GEOLOGIC UNIT: A5y
SM
GP
P-23
C-57 SURFACE ELEVATION: 5570' (1698m)
SURFICIAL GEOLOGIC UNIT: A5y
SM
F-16
C-58 SURFACE ELEVATION: 5375' (1638m)
SURFICIAL GEOLOGIC UNIT: A5i
SM
SP
T-10
C-59 SURFACE ELEVATION: 5368' (1634m)
SURFICIAL GEOLOGIC UNIT: A5i
C-60 SURFACE ELEVATION: 5408' (1646m)
SURFICIAL GEOLOGIC UNIT: A5i
SC
P-24
SM
SP
CS-61
C-61 SURFACE ELEVATION: 5362' (1634m)
SURFICIAL GEOLOGIC UNIT: A5y
10
0 0
1 5
0 0
1 5
2 10
3 10
0 0
1 5
2 10
3 10
4 15
0 0
1 5
2 10
0 0
1 5
2

C-69 SURFACE ELEVATION: 5755' (1754m)
SURFICIAL GEOLOGIC UNIT: A5i

SM

GP

P-28

C-70 SURFACE ELEVATION: 5840' (1780m)
SURFICIAL GEOLOGIC UNIT: A1

SP

CS-70

C-71 SURFACE ELEVATION: 5960' (1817m)
SURFICIAL GEOLOGIC UNIT: I4

SP-SM

P-29

C-72 SURFACE ELEVATION: 5832' (1778m)
SURFICIAL GEOLOGIC UNIT: A5y

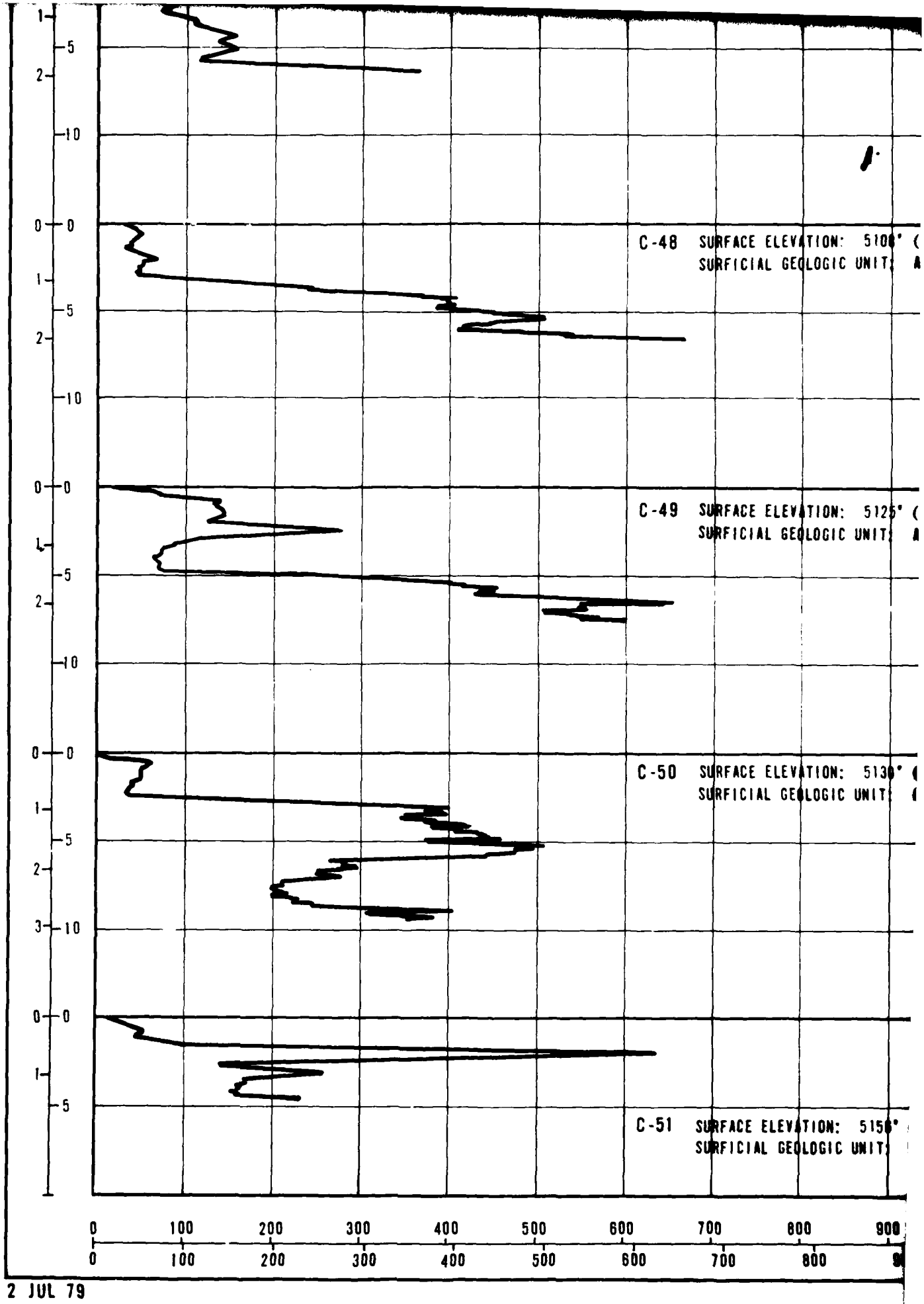
SP

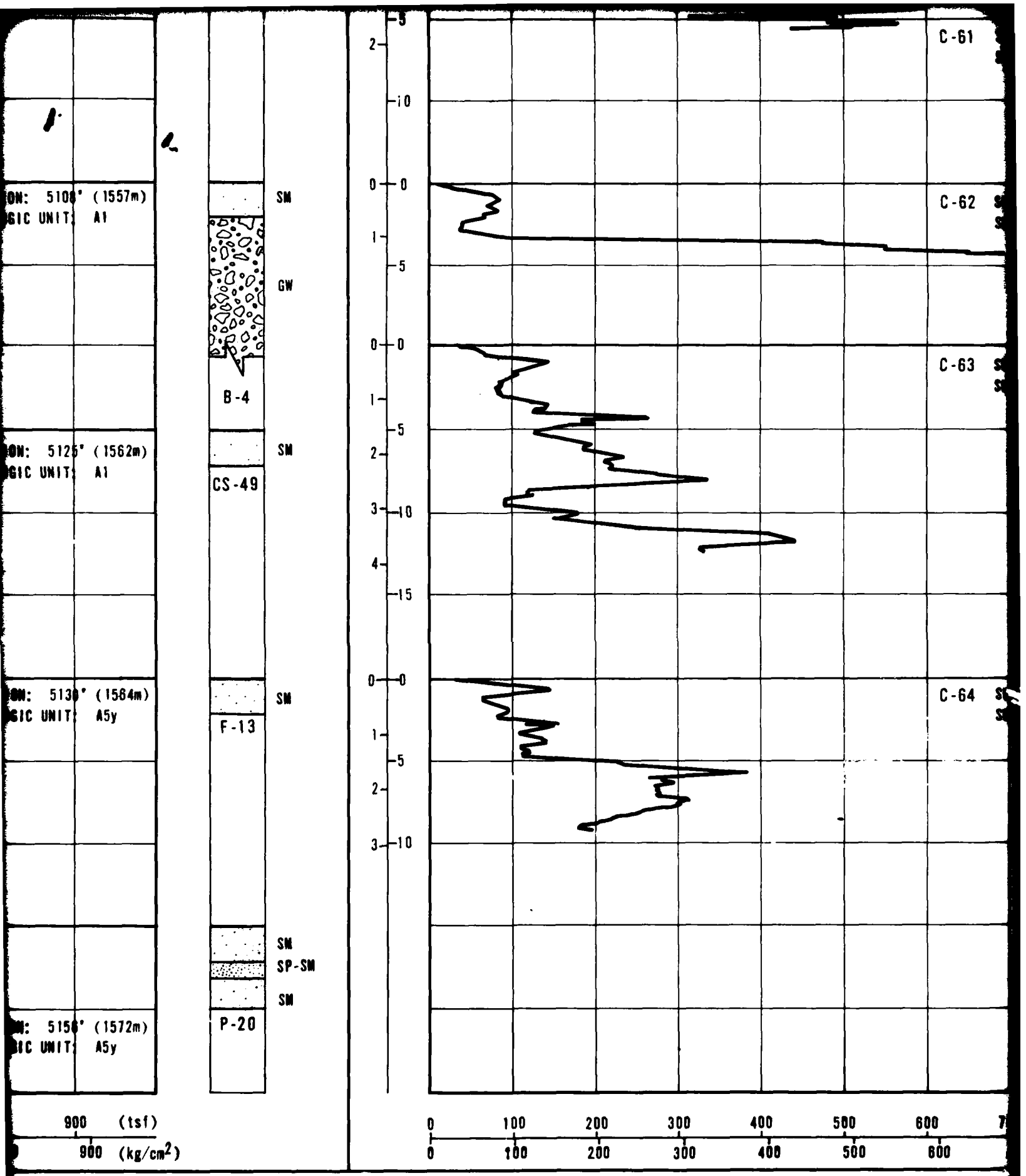
CS-72

C-73 SURFACE ELEVATION: 5955' (1815m)
SURFICIAL GEOLOGIC UNIT: A5y

SP-SM

CS-73


C-48 SURFACE ELEVATION: 5108' (
SURFICIAL GEOLOGIC UNIT: A
C-49 SURFACE ELEVATION: 5125' (
SURFICIAL GEOLOGIC UNIT: A
C-50 SURFACE ELEVATION: 5130' (
SURFICIAL GEOLOGIC UNIT: (
C-51 SURFACE ELEVATION: 5150'
SURFICIAL GEOLOGIC UNIT:
0 100 200 300 400 500 600 700 800 900
0 100 200 300 400 500 600 700 800
CHECKED BY
APPROVED BY
2 JUL 79

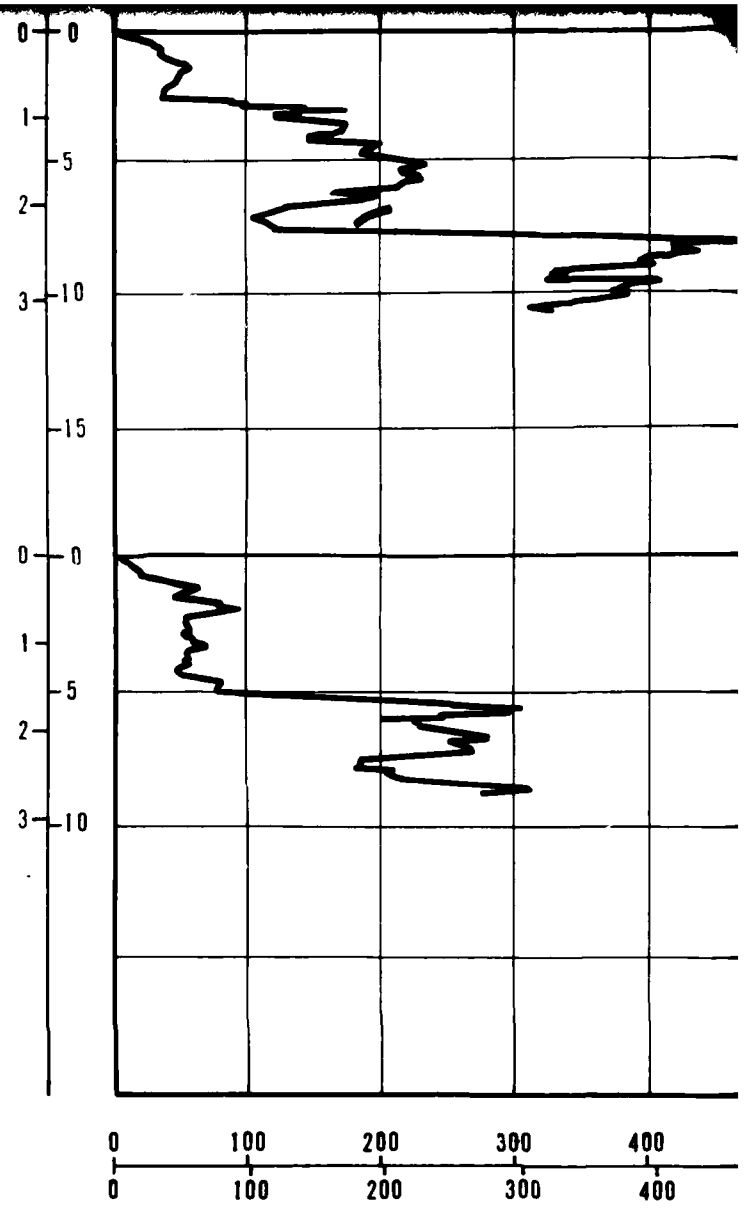

ON: 5108' (1557m)
GIC UNIT: A1
ON: 5125' (1562m)
GIC UNIT: A1
ON: 5139' (1564m)
GIC UNIT: A5y
N: 5156' (1572m)
IC UNIT: A5y
SM
GW
SM
SM
SM
SP-SM
SM
B-4
CS-49
F-13
P-20
C-61
C-62
C-63
C-64
900 (tsf)
900 (kg/cm²)
0 100 200 300 400 500 600
0 100 200 300 400 500 600

C-61 SURFACE ELEVATION: 5362' (1634m)
SURFICIAL GEOLOGIC UNIT: A5y

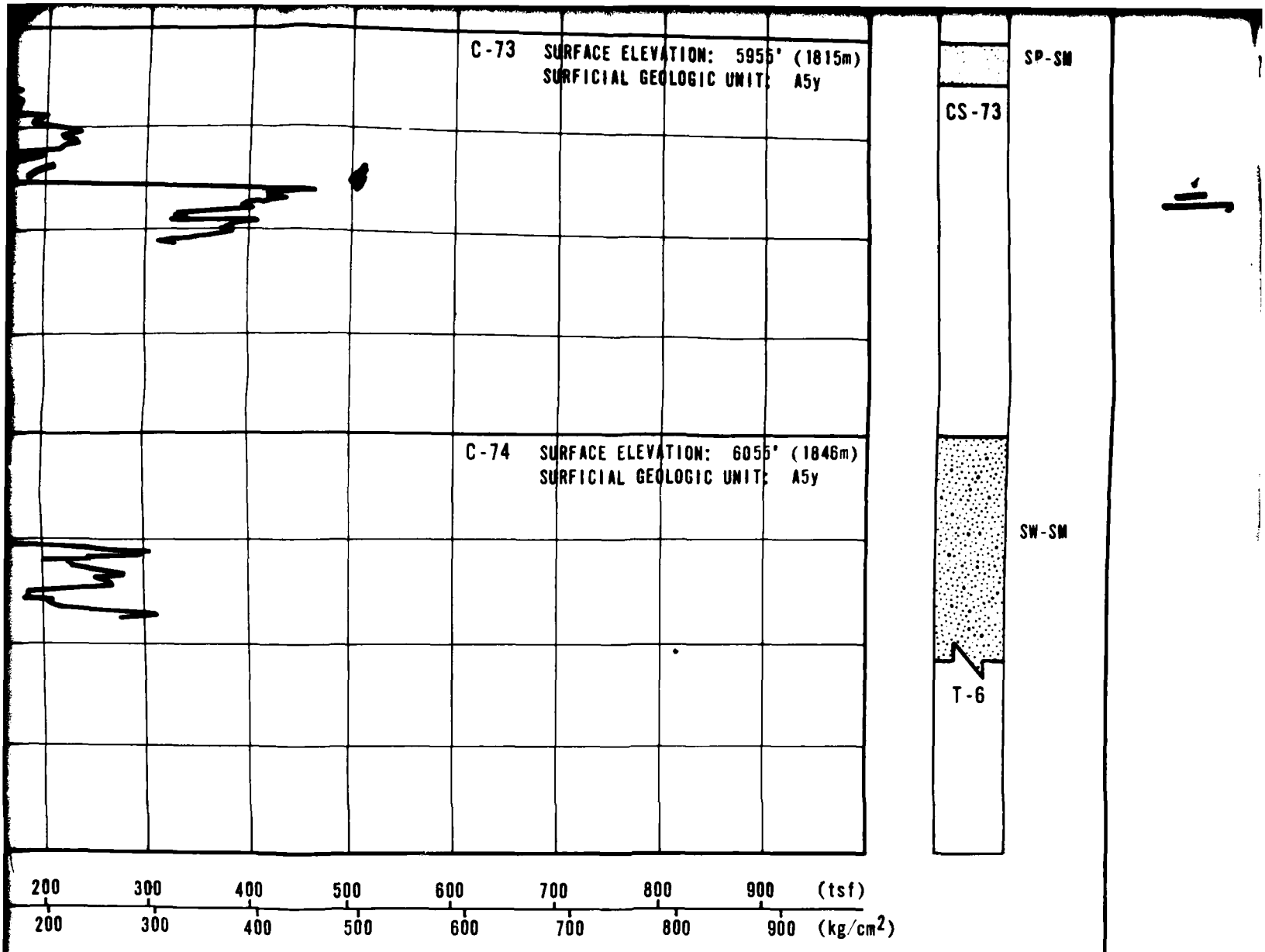
C-62 SURFACE ELEVATION: 5370' (1637m)
SURFICIAL GEOLOGIC UNIT: A5y

C-63 SURFACE ELEVATION: 5355' (1632m)
SURFICIAL GEOLOGIC UNIT: A5y

C-64 SURFACE ELEVATION: 5330' (1625m)
SURFICIAL GEOLOGIC UNIT: A5y



700 800 900 (tsf)
700 800 900 (kg/cm²)



CONE PENETROMETER TEST RESULTS
VERIFICATION SITE
BIG SMOKY CDP, NEVADA

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - SAMSO

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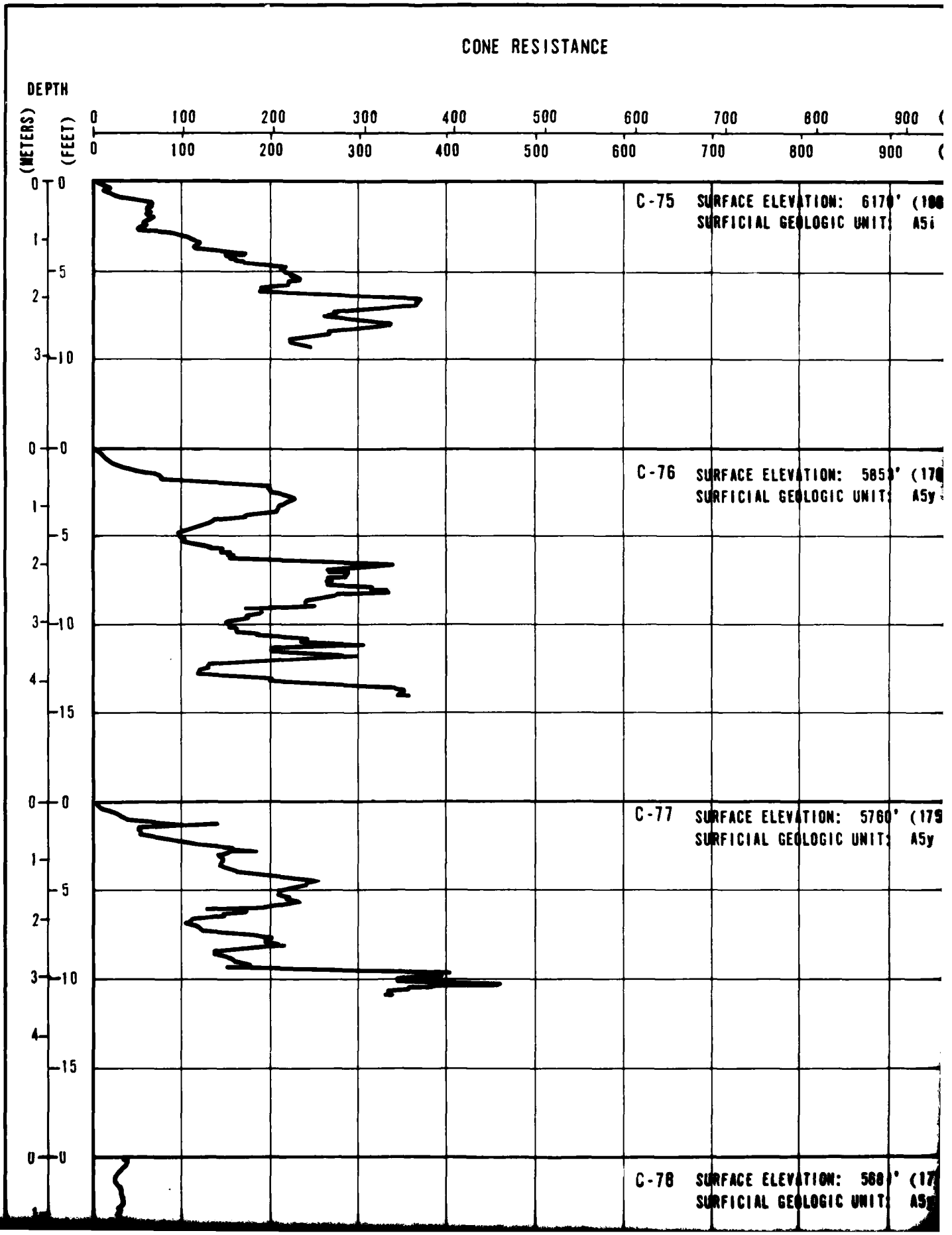
FN-TR-27-VIII


CONE RESISTANCE
DEPTH
(METERS)
(FEET)
0 100 200 300 400 500 600 700 800 900
C-75 SURFACE ELEVATION: 6170' (188
SURFICIAL GEOLOGIC UNIT: A5i
C-76 SURFACE ELEVATION: 5853' (178
SURFICIAL GEOLOGIC UNIT: A5y
C-77 SURFACE ELEVATION: 5760' (175
SURFICIAL GEOLOGIC UNIT: A5y
C-78 SURFACE ELEVATION: 568 ' (17
SURFICIAL GEOLOGIC UNIT: A5

900 (kg cm^2)

900 (tsf)

CONE RESISTANCE

DEPTH

(METERS) (FEET)

0 100 200 300 400 500 600 700

0 100 200 300 400 500 600 700

SOIL COLUMN

6170' (1881m)
UNIT: A5i

SC

GP

P-32

5850' (1784m)
UNIT: A5y

SM

P-30

5760' (1756m)
UNIT: A5y

SP-SM

P-31

5680' (1732m)
UNIT: A5y

SM

F-19

1 3

ESISTANCE

500 600 700 800 900 (kg/cm^2)

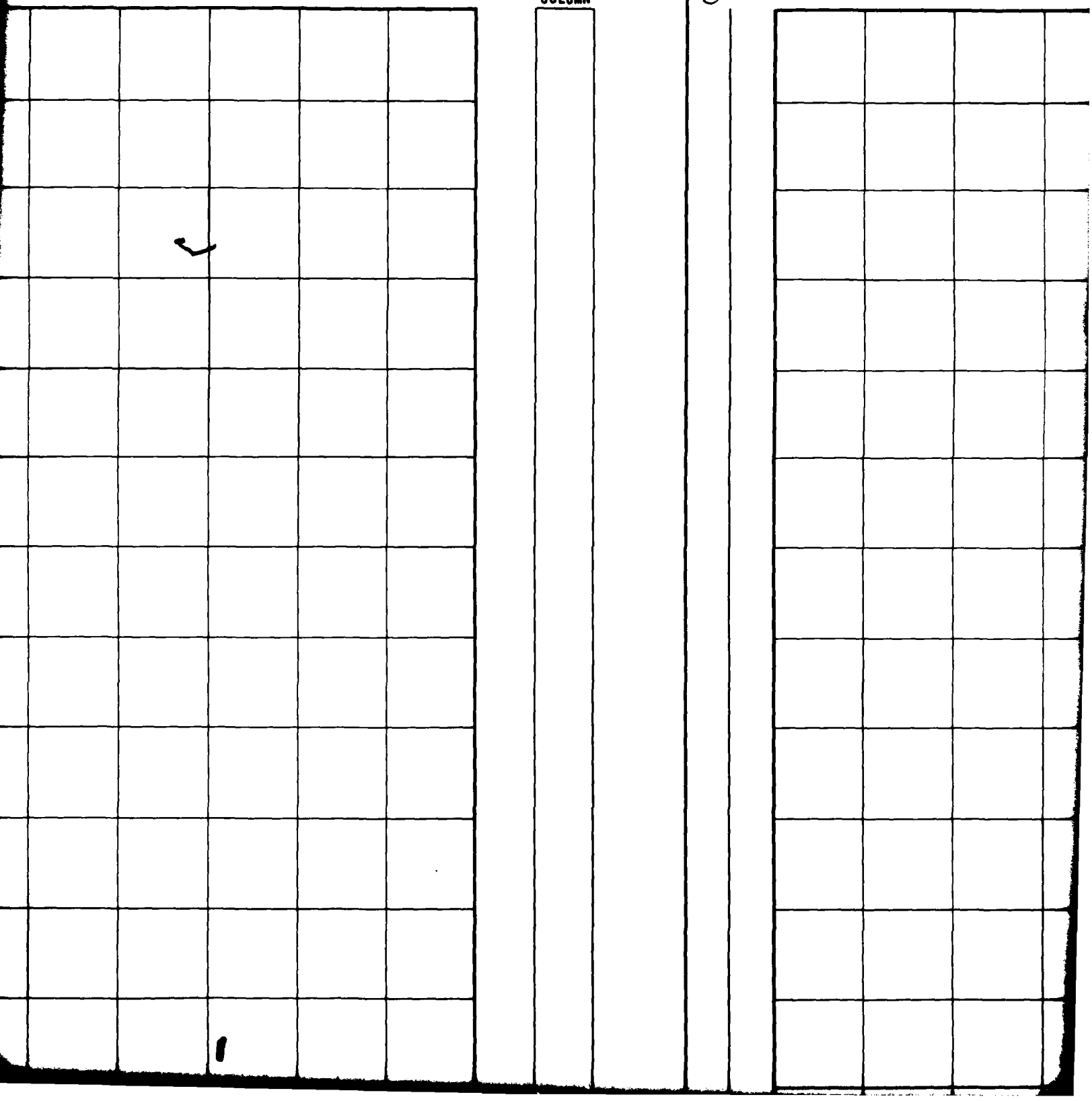
500 600 700 800 900 (tsf)

SOIL COLUMN

DEPTH

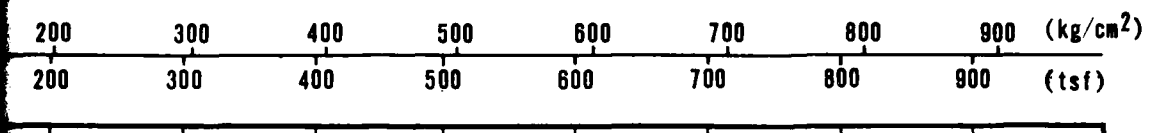
(METERS) (FEET) 0 100 200 300

0 100 200 300

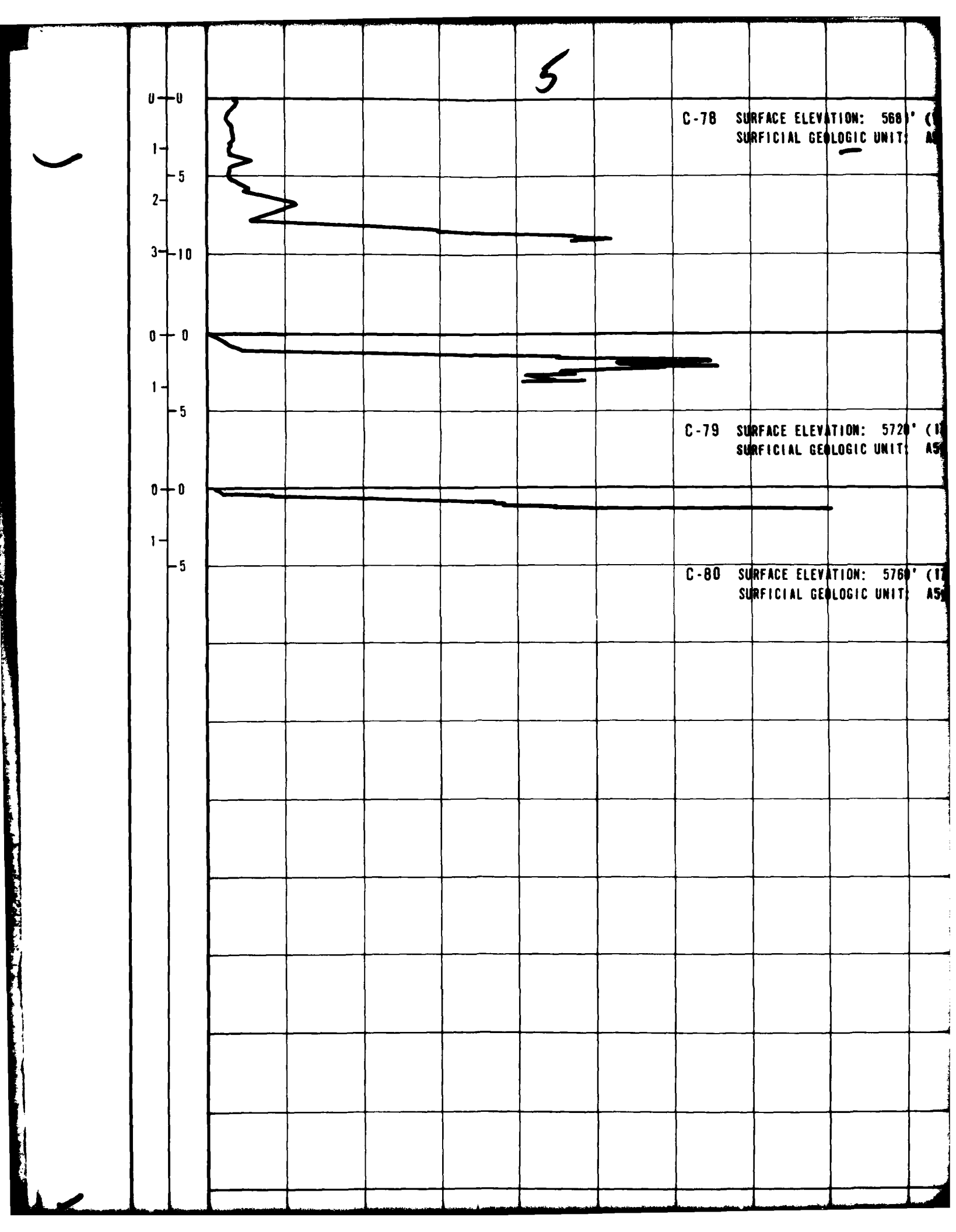


1 4

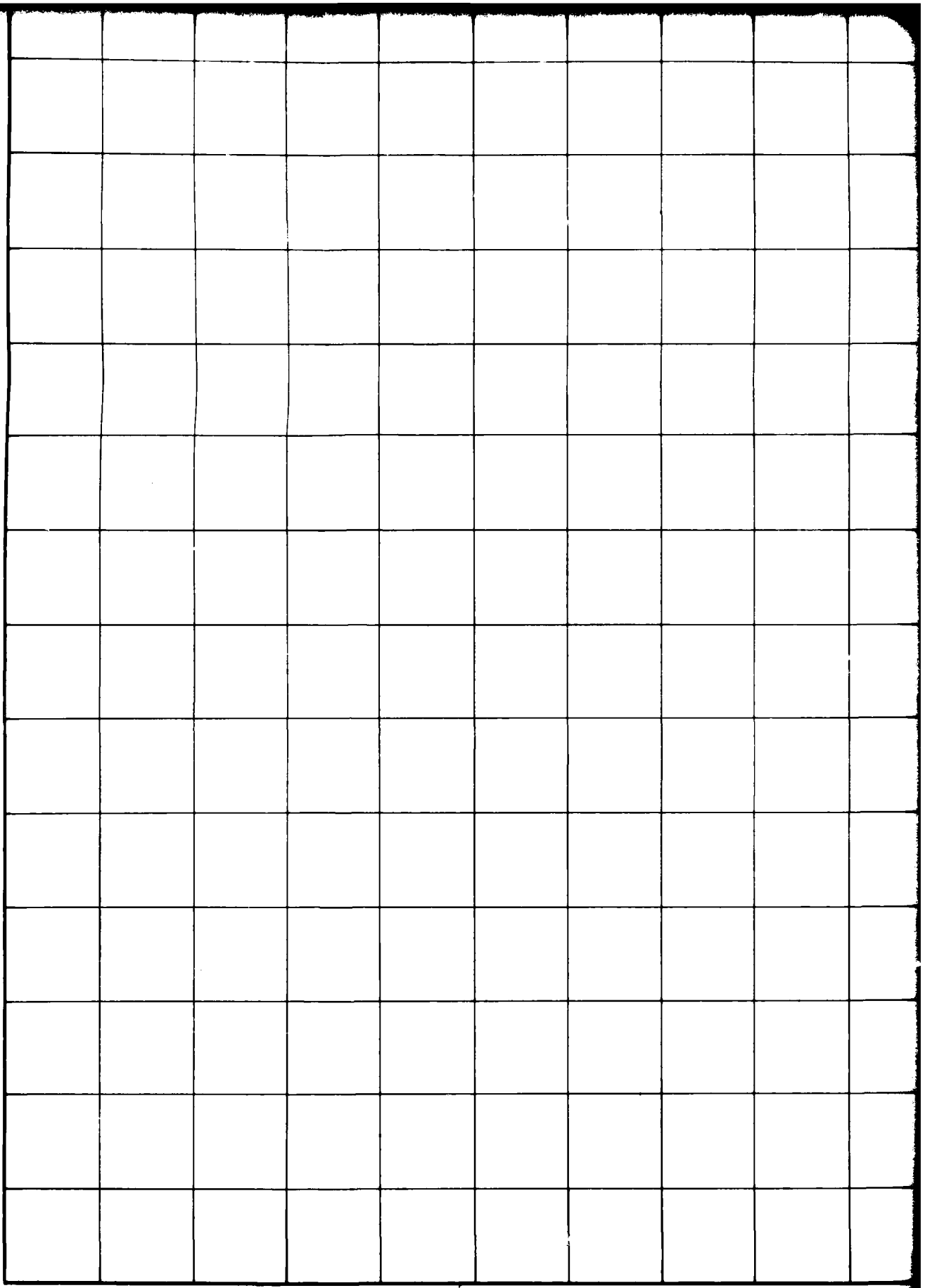
CONE RESISTANCE



SOIL COLUMN

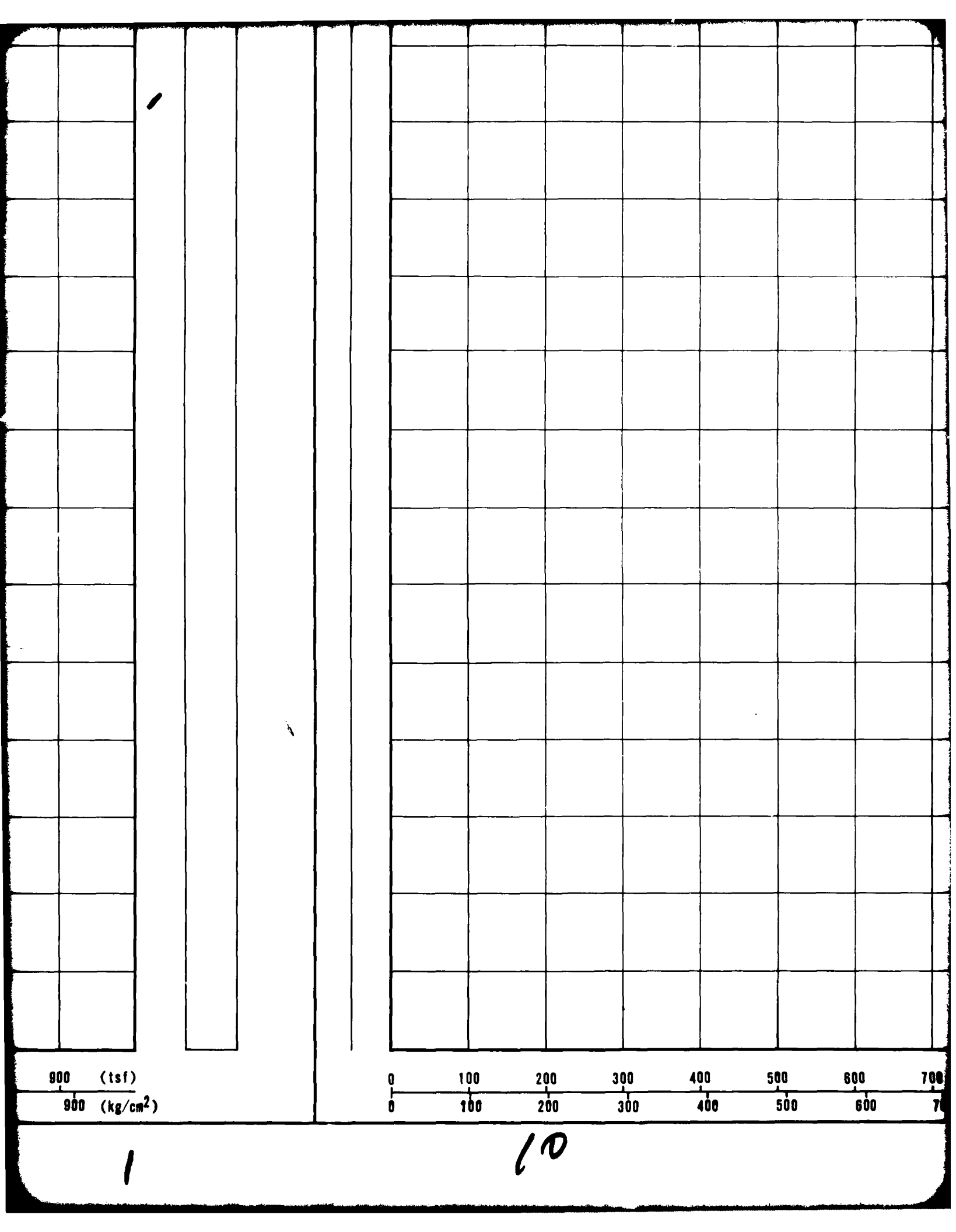

5
0
0
1
5
2
10
3
0
0
1
5
0
0
1
5
C-78 SURFACE ELEVATION: 568
SURFICIAL GEOLOGIC UNIT:
C-79 SURFACE ELEVATION: 572
SURFICIAL GEOLOGIC UNIT:
C-80 SURFACE ELEVATION: 576
SURFICIAL GEOLOGIC UNIT:

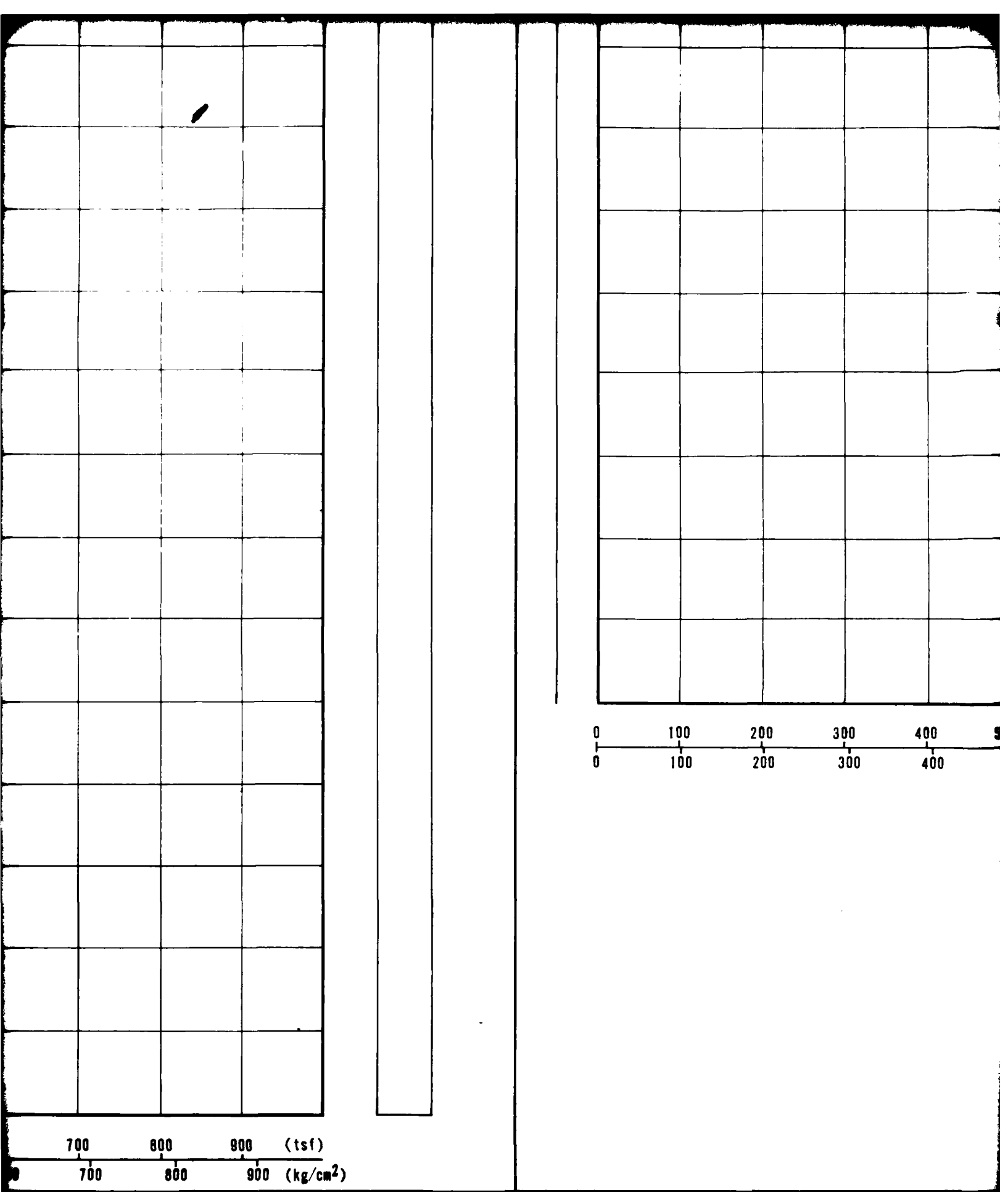

SM
F-19
SC
GP
CS-79
GP
CS-80



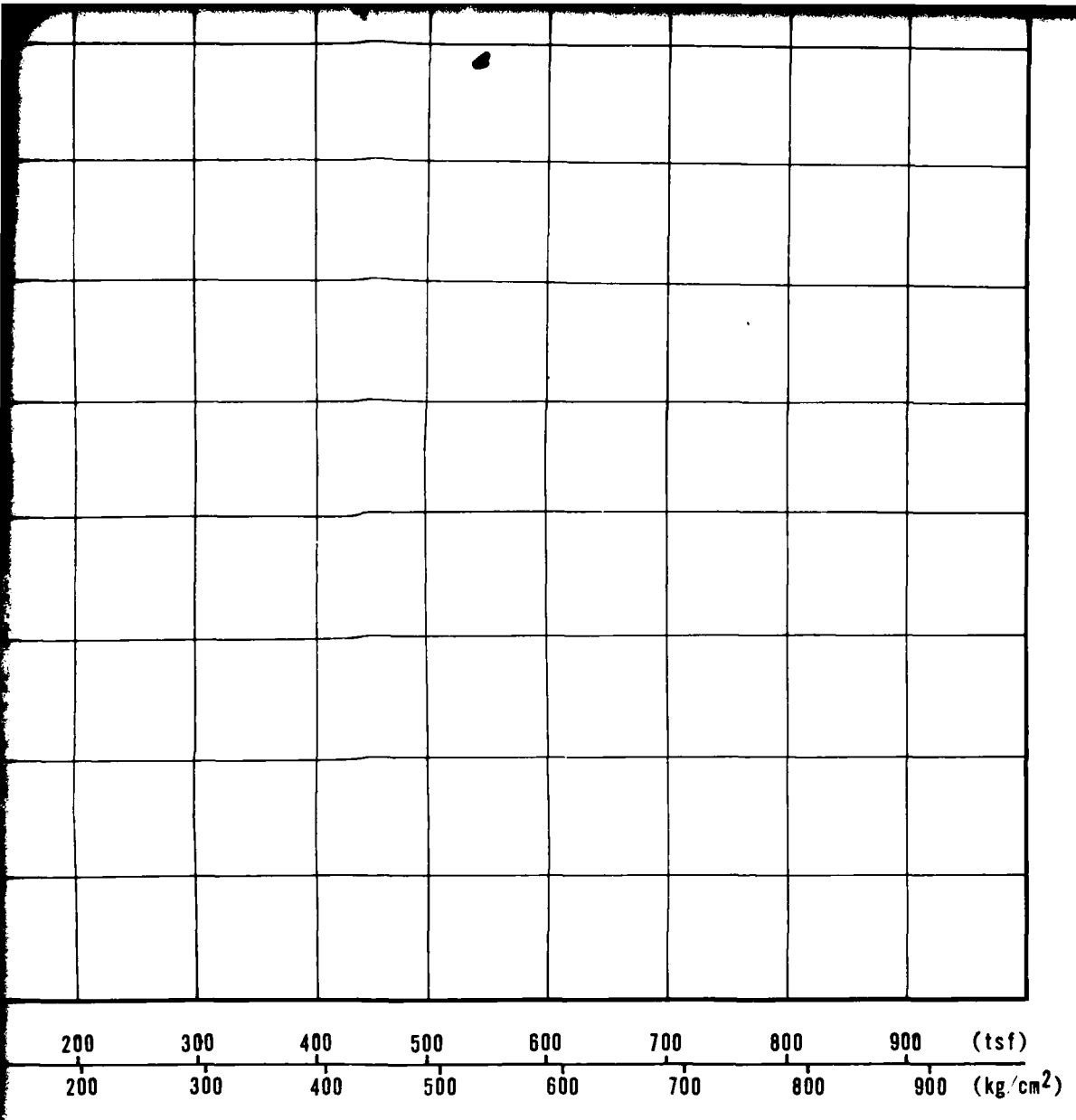
CHECKED BY _____ APPROVED BY _____

2 JUL 79


900 (tsf)
900 (kg/cm²)
0 100 200 300 400 500 600 700
0 100 200 300 400 500 600


0
100
200
300
400
0
100
200
300
400

700
800
900
(tsf)
700
800
900
(kg/cm2)



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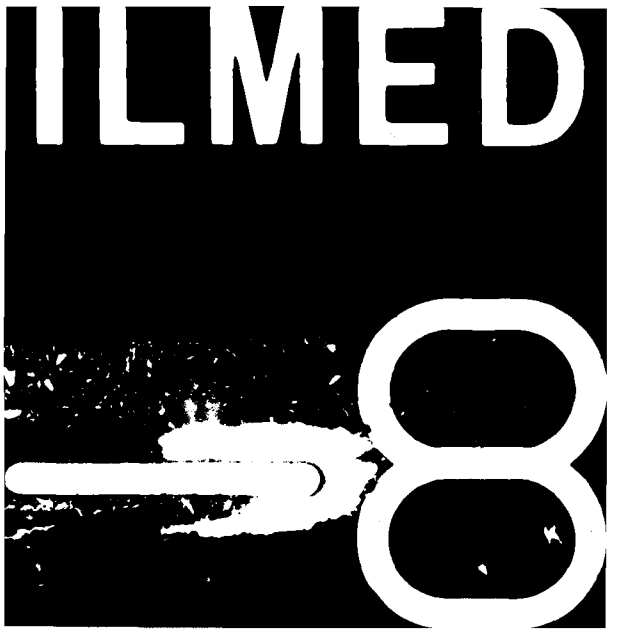
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